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RAPID READING ON THE READING
RATE AND COMPREHENSION OF...

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THE EFFECTS OF TRAINING IN RAPID READING ON THE READING RATE
AND COMPREHENSION OF BRAILLE AND LARGE PRINT READERS

by

Myrna R. Olson

Bachelor of Science, Northern Montana College, 1969
Master of Education, Montana State University, 1971

A Dissertation

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Doctor of Education

Grand Forks, North Dakota

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1975

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This dissertation submitted by Myrna R. Olson in partial fulfillment of the requirements for the Degree of Doctor of Education from the University of North Dakota is hereby approved by the Faculty Advisory Committee under whom the work has been done.

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THE EFFECTS OF TRAINING IN RAPID READING ON THE READING RATE
Title AND COMPREHENSION OF BRAILLE AND LARGE PRINT READERS

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Degree Doctor of Education

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Date September 12, 1975

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ABSTRACT

The purpose of this study was to determine the effects of rapid reading training (as described by Vearl McBride) on the reading rates and comprehension of large print and braille readers. Of specific interest were comparisons among a group taught by McBride and two taught by the researcher under McBride's tutelage. Furthermore, it was a purpose of this study to investigate differences that exist between informal and formal tests given before and after sixteen hours of rapid reading training. Informal testing consisted of oral reporting on individually chosen prose fiction to achieve an estimated "book report" comprehension. This is the type of testing normally employed by McBride in his teaching of rapid reading workshops. Formal testing was done by the researcher and consisted of individually-administered silent reading paragraphs from Spache's Diagnostic Reading Scales. Finally, correlations between rate gains achieved and variables such as age, sex, years of education, minutes practiced, and level of motivation for improvement were also of interest in this study.

Fifteen braille-reading adults, ages 19-62 and with a mean age of 38.6 years, composed McBride's rapid reading group. These adults came from twelve different states and Canada for a two-week workshop held August 5-16, 1974, Canton, Missouri. Members of this group enrolled voluntarily and paid their own tuition and living expenses to attend. Twelve braille readers ages 10-65 and with a mean age of 34.2 years, made up the first group taught by the researcher; the

second group were large print readers, ages 10-19 and with a mean age of 13.5 years. Both of these latter groups were recruited from the North Dakota State School for the Blind and surrounding communities at no personal cost to any member. This workshop was held September 16-27, 1974, in Grand Forks, North Dakota.

The conclusions of this study were:

1. Reading rate can be significantly increased for braille and large print readers after sixteen hours of rapid reading training, without significant change in comprehension.
2. Reading rate on informal tests (no objective measure of comprehension) is significantly greater after rapid reading training than is rate on formal tests.
3. Rates predicted by braille and large print readers before rapid reading training do not significantly differ from rates achieved on informal tests after training.
4. Groups of large print and braille readers, while differing significantly in age, years of education, minutes of practice outside of training, and initial motivation for taking rapid reading training, do not differ significantly in their rate increases or changes in comprehension level after rapid reading training.
5. Rate improvements made by braille and large print readers after rapid reading training are not significantly related to their reading rates before training.
6. Rate improvement after rapid reading training is negatively related to the age of braille and large print readers.

7. Reading rate before and after rapid reading training is negatively related to the number of years a braille reader has previously read print.

8. Rate improvement after rapid reading training is positively related to the use of more than one finger in the braille reading process.

CHAPTER I

INTRODUCTION

Few educators would deny the importance of reading as a basic skill of communication. As our technological society makes more knowledge accessible, schools feel increasing pressure to improve the efficiency of the reading process. One obvious way to increase the efficiency of reading is to read faster. A variety of techniques and methods for training one to read print rapidly have been described by Wood (Staiger and Sohn, 1967), Leedy (1963), and McCorkle and Dinghus (1958).

Reading rate has been a special concern to educators of the visually handicapped. Low degrees of visual acuity necessitate the use of large print or braille materials. Lowenfeld (1973) has indicated that the greatest discrepancy between tactual and sight reading lies in the rate of input. It is much slower for braille reading than for print; the differentiation is not marked in the initial stage, but the gap consistently widens throughout the school years. Reading rates for the individual with a low degree of vision (large print reader) are more comparable to those for braille readers than to those for small print, normally-sighted readers. Studies that report actual rates differ according to the kind of material read, grade level, and abilities of the readers. Despite these differences, one generally can expect reading rates of normally-sighted individuals to exceed braille reading

rates by two to four times. Thus, a greater proportion of a visually handicapped student's time is absorbed in reading the same amount of material read by normally-sighted students.

Sykes (1971) and Hanley (1961) have urged research into the efficacy of rapid reading techniques as they may apply to large print and braille reading. Although the Talking Book and tape player have been of great service to visually handicapped in their reading, neither afford the independence in reading that large print or braille offer. Additionally, Lowenfeld (1945) found that comprehension scores of students reading braille were consistently higher than when the same students listened to a Talking Book.

McBride (1974) reported success in training visually handicapped adults to increase their reading rates by two to five times after approximately ten two-hour rapid reading sessions. No formal test was used to measure comprehension; subjects reported orally on what fiction they had read. A subsequent study by Wallace (1973) found significant gains in rate without loss in comprehension after employing techniques, similar to those of McBride, with visually handicapped adults. Wallace used a formal test and reported group rate increases much more conservative than those reported for McBride's group. Thus, the rate increase a braille or large print reader might expect after rapid reading training is uncertain. Furthermore, no comparative data between informal and formal tests as used by McBride and Wallace is available.

Purpose of the Study

It was the purpose of this study to determine the effects of rapid reading training (as described by McBride) on the reading rates

and comprehension of large print and braille readers. Of specific interest were comparisons among a group taught by McBride and two taught by the researcher under McBride's tutelage. Furthermore, it was a purpose of this study to investigate differences that exist between informal and formal test results of reading rate given before and after rapid reading training. Finally, correlations between rate gains achieved and variables such as age, sex, years of education, minutes practiced, and level of motivation for improvement were also of interest.

Procedures

Three groups of visually handicapped readers were given sixteen hours of training in rapid reading techniques described by McBride (1970). The first group (N=15) was composed of braille readers, ages 19-62, trained during a two-week summer workshop in Missouri by McBride. This group enrolled voluntarily in the workshop and paid tuition and living expenses, since they came from twelve different states and Canada. The second group consisted of braille readers (N=12), ages 10-65), and the third group included large print readers (N=10), ages 10-19; these two groups were trained by the researcher (after tutelage under McBride) during a two-week fall workshop in North Dakota. The latter two groups were recruited by the researcher from the North Dakota State School for the Blind and surrounding areas in North Dakota; no fee or expense was involved for any individual. All three groups were pre- and post-tested both informally and formally. Prose fiction which the readers individually chose (no objective measure of comprehension) constituted the informal test, while Spache's Diagnostic Reading Scales was used as the formal test.

Hypotheses

The following hypotheses were generated from this general question: What are the effects and correlates of rapid reading training on the reading rate and comprehension of braille and large print readers?

1. There is no significant change in reading rate, measured informally, after training in rapid reading for:
 - a. Missouri braille group
 - b. North Dakota braille group
 - c. North Dakota large print group
2. There is no significant change in reading rate, measured formally, after training in rapid reading for:
 - a. Missouri braille group
 - b. North Dakota braille group
 - c. North Dakota large print group
3. There is no significant change in comprehension, measured formally, after training in rapid reading for:
 - a. Missouri braille group
 - b. North Dakota braille group
 - c. North Dakota large print group
4. There is no significant difference between the informal and formal pre-test measures of rate for:
 - a. Missouri braille group
 - b. North Dakota braille group
 - c. North Dakota large print group
5. There is no significant difference between the informal and formal post-test measures of rate for:
 - a. Missouri braille group
 - b. North Dakota braille group
 - c. North Dakota large print group

6. There is no significant difference between informal rates predicted before rapid reading training and informal rates achieved after the training for:

- a. Missouri braille group
- b. North Dakota braille group
- c. North Dakota large print group

7. There is no significant difference among the Missouri braille group, North Dakota braille group or North Dakota large print group on the following variables:

- a. age
- b. sex
- c. years of education
- d. predicted rate before rapid reading training
- e. pre-test rate (measured informally)
- f. pre-test rate (measured formally)
- g. post-test rate (measured informally)
- h. post-test rate (measured formally)
- i. pre-test comprehension (measured formally)
- j. post-test comprehension (measured formally)
- k. percentage increase in rate (measured informally)
- l. percentage increase in rate (measured formally)
- m. percentage change in comprehension (measured formally)
- n. minutes practiced
- o. percentage satisfaction with results of training
- p. percentage of success in rapid reading due to motivation

8. There is no significant difference between the two braille groups on variables listed under hypothesis seven or additionally:

- q. number of hands used in reading braille
- r. number of fingers used in reading braille
- s. number of years of braille reading
- t. number of years of print reading

9. There is no significant difference among the three groups on the following post-test measures after covariance techniques have been applied to pre-test:

- a. rate (measured informally)
 - b. rate (measured formally)
 - c. comprehension (measured formally)
10. There is no significant correlation between any two variables as listed under hypotheses seven for the three groups.
 11. There is no significant correlation between any two variables as listed under hypotheses seven or eight for the two braille groups.

Delimitation of the Problem

This study was conducted within the framework of the following delimitations:

1. The subjects involved in this study were not randomly chosen. The adults comprising the Missouri braille group were those who voluntarily sought the rapid reading training after learning about other workshops McBride had conducted. The subjects in the two North Dakota groups, taught by the researcher, were those in the Grand Forks, North Dakota area who could attend the workshop without cost of travel and living expenses and students in grades 4-12 enrolled at the North Dakota State School for the Blind.
2. The difficulty in obtaining a sufficient number of visually handicapped subjects for control groups to match each of the experimental groups was prohibitive.

Limitations of the Problem

1. The study was conducted under the following limitations and assumptions:

1. The rapid reading training given by McBride to his group of braille readers in Missouri and that given by the researcher to the group of braille readers and large print readers in North Dakota was assumed to be sufficiently similar to allow comparisons of group results.
2. There were no group reading tests with suitable format or normative data for large print or braille readers available at the time of this study. Spache's Diagnostic Reading Scales, an individually administered reading inventory, was therefore considered sufficient to measure changes in rate and comprehension after being transcribed by the researcher into large print (size 18) and braille (grade 2).
3. Spache's Diagnostic Reading Scales, with silent reading passages from grade level 1.6 to 8.5, was assumed to have sufficient reliability and validity for the purpose of this study.

Definition of Terms

Missouri braille group. That group of fifteen adults, ages 19-62, who paid tuition and expenses to a workshop August 5-16, 1974, taught by Vearl McBride, Canton, Missouri; members of this group came from twelve different states and Canada.

North Dakota braille group. That group of twelve individuals, ages 10-65, taught by the researcher in a workshop September 16-27, 1974, and recruited from grades 4-12 of the North Dakota State School for the Blind and adults in an area surrounding Grand Forks, North

Dakota; no tuition or living expenses were involved for members of this group.

North Dakota large print group. That group of ten individuals, ages 10-19, taught by the researcher in a workshop September 16-27, 1974, and recruited from grades 4-12 of the North Dakota School for the Blind and adults in an area surrounding Grand Forks, North Dakota; no tuition or living expenses were involved for members of this group.

Rapid reading training. Those methods and techniques which are employed to improve the efficiency of the reading process through increasing reading rate.

Braille readers. Those visually handicapped individuals, regardless of visual acuity, whose mode of reading is primarily the tactual braille system; grade 2 braille was the contracted form of braille read by these individuals throughout the study.

Large print readers. Those visually handicapped individuals, regardless of visual acuity, whose mode of reading is primarily large print type (size 18 or larger).

Formal test. Three silent reading passages from Spache's Diagnostic Reading Scales which were individually administered and accompanied by objective questions for comprehension.

Informal test. Any individually chosen prose fiction read silently by an individual (at his approximate reading level) and subsequently reported on orally to achieve an estimated 80% (or better) level of comprehension.

CHAPTER II

REVIEW OF THE LITERATURE

Rapid or "speed" reading techniques have been the subject of extensive research and controversy. This chapter will first review the issues and studies evolving out of this controversy as they relate to reading of normally-sighted readers. The relative efficiency of and factors unique to large print and braille reading will be presented. Finally, studies relating to rapid reading training for visually handicapped will be reviewed.

Rapid Reading Issues and Controversies

Definition

Rapid reading seems to be a term used interchangeably with "speed reading" throughout the literature. Although both terms have been defined in a variety of ways, they suggest facilitation of the reading process through faster rates of reading. A survey of experts in the field of reading by Berger (1968) revealed "increased efficiency of reading" as the most accepted definition. Other definitions mentioned in order of their popularity were: increased rate of comprehension, increased flexibility of reading, increased rate of reading, and speed of comprehension. Regardless of the words used in the definition, what actually occurs when one "speed reads" is the central issue of debate. McBride (1970) described his rapid reading techniques

as those which enable every word to be encountered in the reading process, while Spache (1962) defines rapid reading as "the act of reading most of the words on a page." Berger (1968) further points out that some experts view the latter description as *skimming* and not reading in the traditional sense.

Claims and Advertisements

Woods (1960) and others have indicated that the average sighted adult reads 200-400 words per minute (WPM). There is very little agreement among proponents of rapid reading techniques regarding a maximum rate of reading. Berger (1970) reviewed the claims of those well-known programs reporting some of the highest rates of reading. The Evelyn Woods Reading Dynamics, Inc. guarantees a tripling of reading efficiency (computed as rate times comprehension) in eight two and one-half hour sessions or tuition is refunded; the average graduate reportedly reads between 1,500 and 3,000 WPM. The Optimation Rapid Reading Course advertises a rate of 5,000 WPM for their average trainee; one person after this training achieved 40,000 WPM. Vearl McBride reported having trained a five-year-old to read 6,000 WPM, a high school junior to read 50,000 WPM, and an eleven-year-old to read 123,000 WPM. Programs such as Tachist-O-Film guarantee gains in rate without specifying figures.

Shale (1969) studied the reading processes of three gifted readers: One subject was a twelve-year-old American girl, the second a fifteen-year-old Phillipino girl, and the third a thirty-eight-year-old housewife. All three individuals read in excess of 20,000 WPM on material of college-level difficulty with 70% or better comprehension; each one also was found to be highly eidetic (having the ability to picture something in detail after briefly looking at it).

In addition to the wide variety of reading rates reported, there is no apparent agreement concerning the relationship of rate and comprehension after training in rapid reading. Ray (1962) studied the Oklahoma University College Reading Improvement Program and found that trainees made significant gains ($p < .01$) in both rate and comprehension on the Nelson-Denny Reading Test immediately following the training. No significant changes in rate or comprehension were found on a re-test three months later. Six months following the training, an additional rate gain ($p < .05$) occurred; comprehension again did not significantly change on this re-test.

Brim (1968) conducted a study on the effectiveness of thirty half-hour sessions of rapid reading training given to ninety-four high school girls. He found that the group increased its average reading rate from 256 WPM to 629 WPM on the Nelson-Denny Reading Test immediately after the training. Comprehension increased from 36 to 40; both rate and comprehension gains were significant ($p < .01$). One interesting effect of this study was the continued improvement in this group's comprehension (to 44) three months after the training ended. The group's reading rate on this re-test actually declined to 615 WPM; the comprehension gain and the rate loss were both significant ($p < .01$).

Graf (1973) tested thirty-one students enrolled in a privately conducted speed-reading program at the University of Redlands, California, on four types of literature: heavy fiction (i.e., Dr. Zhivago), heavy non-fiction (i.e., articles from Experimental Psychology), light fiction (i.e., short stories from Redbook), and light non-fiction (i.e., articles from Playboy). A control group was pre- and post-tested on the same material and achieved no significant rate gain or comprehension

loss; the experimental group increased its reading rate by 221% with a decline in comprehension (from 70% and better to 40-70% range). A few individuals in the experimental group received simultaneous rate and comprehension gains. A conclusion, based on this study, would posit a negative correlation between rate and comprehension after rapid reading; the relationship is perhaps ultimately determined by factors unique to an individual's personality rather than to the training itself.

Measurement

A comparison of rate gains after rapid reading training is extremely difficult. The multiplicity of measurement devices used, the type and level of material read, and the standard of comprehension accepted all contribute to the complexity of any comparison.

Many writers report reading rate scores without mention of comprehension, and this renders the efficacy of the rapid reading training meaningless. Still others report comprehension as informal estimates of understanding. Believing that formal tests introduce an artificiality to the reading environment and still inadequately measure comprehension, subjects tell orally what they read until an approximation of "book report" understanding is achieved (McBride, 1970). Those studies which do report formal rate and comprehension have employed tests which differ substantially in their validity and reliability. Comprehension questions on these tests vary from being group multiple choice or true-false items to individually administered questions requiring one-word or one-sentence oral responses.

Berger (1968) pointed out that interpretation of rapid reading measurement data can be confusing and misleading. He used the Wood Reading Efficiency Index as an example; it is computed by multiplying

one's rate (in words per minute) by the percentage comprehension. Thus, one may increase his Reading Efficiency Index by four times with these results: beginning rate of 300 WPM with an 80% comprehension level to yield an index of 240; a rate after training of 2000 WPM with a 50% comprehension level to yield an index of 1000.

Maxwell (1965) suggested that some people may possibly be able to read 40-80% faster simply by being told to read faster. Before reading rate gains can become meaningful, it would be essential to assess one's potential for reading faster prior to any training in rapid reading.

Perception

Central to the evaluation of rapid reading techniques is the disagreement about the limits of human perceptual ability. Spache (1962) claimed that reading rates beyond 800-900 WPM are physiologically impossible. He based this limitation on the assumption that a print reader's eye movements include at least one fixation per line. He further points out that the shortest fixation possible is $1/6$ to $1/5$ second with sweeps to succeeding lines and/or fixations taking $1/30$ to $1/25$ second; as a result he concluded that the human eye fixates on no more than 2.5 to 3.0 words at a time.

Taylor (1962) reported having taken eye photos of forty-one trainees who had completed the Woods Reading Dynamics Program. He found that their eye movements did not differ from those of "normal" readers. The eye photos resemble those taken by other experts of the eye during a "skimming" process. The explanation offered by rapid reading specialists to this data relates to the inadequacy of present

cameras; it is their opinion that no photographic technique to the present time is sophisticated enough to measure the eye movements of rapid reading trainees (Berger, 1970).

Stevens and Oren (1963) disputed those who would impose limitations on the human perceptual span. They believed that it is possible to "break the sound barrier" in the reading process. That is, one can perhaps read so rapidly that a movement is made directly from symbols to meaning.

Amble (1967) conducted a study with fifth graders ($N=375$) to determine the effectiveness of phrase reading training in improving one's perceptual span. He divided the students into two experimental groups and one control. The first experimental group received a training program of 5,200 continuous, meaningful phrases on a film series, while the second experimental group received half this amount (2,600 phrases). The control group received no phrase training. On the Iowa Silent Reading Test of rate, the 5,200 phrase group made over a 2 1/2 years' greater grade-equivalent gain than the 2,600 and no-phrase groups on the post-test. This gain was statistically significant ($p < .001$). The 5,200 phrase group made over one's year's greater grade-equivalent gain on the Iowa Silent Reading Test of paragraph comprehension; the 2,600 phrase group made a relative gain of three-quarters of a year over the no-phrase group ($p < .01$). The experimental group receiving the most phrase training made twice the gain in perceptual span than the no-phrase group made. It was concluded from this study that an individual's perceptual span can be increased to the point where rate and comprehension are subsequently increased.

Geyer's (1968) experiment with 2,465 eye-voice pairings and other recent research prompted him to propose a reading model that included six major systems (Geyer, 1970): visual input, coding, iconic storage, internal response, verbal storage, verbal output. He hypothesized that visual input is sequentially ordered within the fixational pause; the major function of the saccadic movements would be to keep the eyes in a position where the attentional scanning is within the retinal area of fine discrimination, and input could take place during any time segment of the fixational pause. After input, the letters are organized, coded and scanned into words and higher order units. The units are then transferred to the icon storage system, where they remain accessible for response for approximately one second; if no response is made, the units are lost. The primary function of this system is to act as a temporal buffer between sensory and response phases to allow integration of the different processing rates.

The interactions between the rate at which responses can be made, the elements making up response units, and the length of time icons remain in storage are seen as the major factors governing speed of reading and eye movement characteristics (Geyer, 1970, p. 77).

Geyer further hypothesized that the icon, available for approximately one second, makes it possible to have smooth processing and probably, reading by phrases.

Lerner (1971) pointed out the difficulties in studying the decoding processes involved in reading. Even though it appears that one's eyes go from left to right during the reading process, the mind does not. The flow of thought is sometimes circular as illustrated by the following sentence: "When Lee looked at the note again, he realized it was a sharp." One must read the word "sharp" to derive

the real connotation of the words preceding it. It is not difficult to understand that the perceptual process involved in reading has not been totally explained.

Subvocalization

Most advocates of rapid reading techniques maintain that one does not have to subvocalize to comprehend the printed symbol. That is to say, the printed symbol does not have to be internally vocalized prior to being interpreted by the brain. Kump (1971) proposed this analogy: A blind man has learned to hear perceptively without sight; fast readers have learned to perceive visually without inner speech. Those opposing reduction of subvocalization during the reading process believe that it is a necessary step to good understanding (Pauk, 1968).

There is a lack of evidence regarding the effects of reducing subvocalization; presumably this is true because of the impossibility of measuring what cannot be seen, heard, or touched externally by any known measurement device. Berger (1968) reported a study by the U.S. Office of Education involving 211 elementary school children and their reading habits. They found that the better readers had more inner speech than the poorer readers; furthermore, as inner speech increased, comprehension increased. It was not clear from this study how inner speech was measured, nor what criteria determined which readers were the better readers. The question regarding the role of subvocalization in the reading process remains. It is not known if inner speech must precede the development of good reading, or whether good reading evolves despite this variable.

Machines vs. Non-Machines

One of the popular methods of increasing speed has been the use of machines such as the tachistoscope. These machines control the pace at which reading material is presented, and thus they force a reader to perceive print more rapidly with increasing rates of presentation. Berger (1970) reported on a study done at Syracuse University with four types of speed reading devices: tachistoscope, controlled reader, controlled pacing, and paperback scanning. All four devices enabled readers to obtain significant gains in rate with no significant change in comprehension. All but the tachistoscope brought gains in flexibility; paperback scanning was superior to all. The cost of these machines varied between \$150 and \$3,500. The conclusion reached was that similar results could perhaps have been obtained without machines; however, machines provided the needed motivation for improving reading rates in some cases. Finally, Karlan (1958) reported that eleven of twelve groups receiving rapid reading training without machines equalled or surpassed groups trained by machines.

Retention of Gains

To the present time, there is still some question regarding retention of rate gains obtained after training in rapid reading. Each study has re-tested at different intervals and found varying degrees of retention. Ray (1962) summarized fifteen studies on retention of rate gain after rapid reading training. Seven of the groups retained gains upon a later re-test, five declined in rate, and three made additional gains. Brim (1968) reported maintenance of rate and comprehension gains over three and six-month intervals for ninety-four high

school girls receiving rapid reading training. Similarly, Cosper and Kephart (1955) found that significant fractions of speed gained in training programs at Purdue University in rapid reading were retained by students fourteen months after training ended.

Large Print and Braille Reading

Large Print

Sloane (1963) and others have indicated that visually impaired children read standard print faster and more effectively than large print. Sykes (1971) presented similar evidence, provided conditions for reading are optimum and corrective lenses for very near vision are prescribed. There is some indication of less fatigue for visually impaired students who read large print than for those reading small (standard) print.

McNamara, Paterson and Tinker (1953) conducted a study of type size and its influence on speed of reading. The conclusions drawn were that: (1) type size had no effect on speed until habits were established (about third grade) and (2) once habits were established, type that is too small (size 6,8) or too large (size 18,24) is not read as rapidly as the in-between types (sizes 10, 12, 14).

Further, reading speed, comprehension and visual acuity were found to be unrelated in a study by Birch, Tisdal, Peabody and Sterett (1966) involving fifth and sixth grade partially seeing children. Each subject, regardless of visual acuity, had an equal chance of becoming a fast reader. Barraga (1964) has demonstrated that children can be trained to use small amounts of vision more efficiently in the reading process, if they were given lessons in visual discrimination.

Lowenfeld (1973) has indicated that reading rates for large print readers are more comparable to those for braille readers than to those for small print readers. It seems that in the lower grades, small print readers exceed braille readers in rate by 100-150%. As readers approach an adult reading level, small print is read approximately 100-300% faster than braille. A study made by Wallace (1973) revealed that adult large print readers had rates 70-80% faster than adult braille readers. There appears to be great variation in rate among those who read large print. How rapidly large print can be read compared to standard print is perhaps more a function of proper utilization of vision.

Braille

Studies by Heber (1967), Holland and Eastman (1933) and others suggest a similarity between touch reading and visual reading. Braille has repeatedly been shown to be less efficient than print in the rate at which it can be perceived. Most studies indicate that the average adult print reader exceeds the average adult braille reader in reading rate by at least two or three times (Holland and Eastman, 1933; Hanley, 1961). Niday (1939) found that braille readers had slightly greater comprehension than did print readers of similar age and ability.

The length of time needed to learn braille varies a great deal from individual to individual. As would be expected, practice tends to increase both reading rate and comprehension. Girls have been found to read braille faster than boys and with greater understanding (Niday, 1939; Umsted, 1972).

In Holland and Eastman's (1933) study, braille reading rate was not significantly affected by intelligence at grade level four; however,

comprehension was positively related to intelligence. At grade eight, both rate and comprehension were positively correlated with intelligence. Nolan and Kederis (1969) proposed that a greater integrative power is needed to develop skill in braille reading than is needed for print reading; results of the study showed that faster readers (mean rate 130 WPM) had a mean intelligence test score of 120, while slower readers (mean rate of 65 WPM) had a mean intelligence test score of 100.

The findings of Burklen (1932) concurred with Maxfield's (1928) research, which was reported in the first comprehensive book concerning braille reading. In her book, she encouraged using both hands in braille reading. The best readers were those who read ahead with the left hand before completing the preceding line with the right hand. Maxfield claimed that letters are actively perceived by the reading finger as it progresses over them; hence, the whole-word approach to teaching braille reading was far superior to the letter-by-letter approach. The use of the whole-word approach by two-thirds of the teachers of blind children today attests to Maxfield's continuing influence (Lowenfeld, Abel and Hatlen, 1969).

While studying the silent reading habits of blind children, Holland and Eastman (1933) noted that good braille readers accompanied more rapid return sweeps and exhibited fewer regressive hand movements. Fast braille readers were found to use less pressure than slow readers, although pressure used varied within a line of braille. Fertsch (1946) concluded that reading habits among blind children were formed prior to third grade and were not affected appreciably by increased reading experience after that time. In agreement with earlier findings, good readers covered a significant amount of material with independent movement of

both hands; furthermore, twice as much was read with the right hand as with the left.

Foulke and Lappin (1973) experimented with the reading effectiveness of all combinations of one to four fingers in the braille reading process. They concluded that the best combination for reading efficiency was the two index fingers. Results for one finger alone were similar to those for four fingers together. It was not clear from this study how much practice readers, using more than one finger, had had prior to the experiment.

Rapid Reading for Visually Handicapped

Nolan and Kederis (1969) found that slow braille readers had greater recognition thresholds than fast braille readers. They also demonstrated that the basic perceptual unit in braille reading is the individual cell character rather than words or phrases. Studies by Umsted (1972) and Wallace (1973) have shown that training in rapid recognition of the braille cell significantly increases braille reading rate. Wallace found further that a group receiving rapid reading training alone exceeded a group receiving rapid reading training coupled with recognition training in terms of rate gain. He concluded that the recognition training perhaps interfered with the rapid reading training, hence producing reduced gains in rate. The two treatments appeared to involve two distinct and opposing perceptual units. Recognition training (both tactile and visual) stresses symbol (code) accuracy as its key element. The perceptual unit in recognition training was presumably spatial; the reader tried to get as much accuracy as possible from the configuration. Initially, at least, this spatial-perceptual

unit was the individual print symbol or braille cell. The key factor for rapid reading instruction was speed (covering a maximum amount of information in a specified time period). The processing time, then, appeared to be the governing factor; the perceptual unit for rapid reading was more temporal than spatial in nature.

Crandell (1974) proposed a new theoretical formulation which retains the essential qualities of the Nolan and Kederis (1969) theory and at the same time, incorporated the findings of Wallace. Two kinds of perceptual windows are proposed--one spatial (the braille cell or print symbol) and the other temporal.

Although each spatial unit must be recognized sequentially, it is possible for a relatively large number of these units to be processed in a given period of time. Some writers have suggested the existence of a mechanism in information processing which acts as a temporal buffer. Information received through the senses is accumulated and segmented in temporal units which are then processed as a single unit. The more spatial units which can be accommodated in the temporal units, the more total information available to the perceiver. The length of the temporal unit has not been specified, but it may be of varying durations . . . from less than one second to several seconds (Crandell, 1974, p. 5).

Grunwald (1966), in a study of the braille reading process, used a device which moved sheets of paper embossed with braille characters over a platelen either continuously at precisely controlled rates, or in accurately timed steps. Several braille readers were asked to read a page picked from a high school biology test, without vocalization or subvocalization, word for word, as fast as they could. The same readers were also presented with sheets containing randomly-selected words and blank spaces (during which the subject pronounced the words previously read). Finally, a sheet containing meaningless binary dot patterns (dot/dot, dot/blank, etc.) was presented to these readers, and they were asked

to perceive the presence or absence of the dots, spaced at the distances of braille dots. All three tests yielded the same maximum sweep rate (13.8 centimeters per second, equivalent to 22 braille characters per second or approximately 320 WPM). Grunwald concluded that pattern recognition in reading was not correlated to comprehension. He further suggested that braille readers do not slow down when unsure of the meaning of what they are reading; instead, they seem to read intermittently. It is not clear how comprehension of material presented to his subjects was measured. Another major conclusion of this study was that the braille reader perceived patterns in time rather than in space; he is concerned with rhythm rather than geometry. A sweep rate of 320 WPM, as found in this study, is barely enough time to resolve inter-character dot distance (3.75 millimeters) and not enough time to resolve distance between dots (2.5 millimeters). Thus, if the reader would need to grasp the "real geometry" of the character in order to understand it, he would not only have to infer it from a moving impression, but also from one which is further modified and distorted by apparent fusion of dots within a character at high reading rates. It would seem that the braille reading process is not a static one, and perhaps differs from the visual reading process. Grunwald further suggested implications for teaching braille from his study. He indicated that we presently do not help braille readers to make the transition from studying the static braille cell geometry to the dynamic process of reading. Few readers develop a smooth return sweep, and thus are handicapped in their speed. By increasing the rates of "return sweeping" (such as accomplished by this study's mechanical device), Grunwald believed that rates of reading could be significantly raised for average and poor readers.

Various mechanical devices have been used to enhance the reading rates of braille readers. Heber (1967) found three different devices were successful in improving the braille reading rates of children (grades three to nine) and adults when compared to control groups not using these devices. The machines employed were a tactual discrimination device, a braille tachistoscope, and a braille reader (which moves braille on a tape from right to left across an exposed presentation window). A study by Kederis (1971) revealed no significant increase in braille reading rates after training on a tachistotactometer or an IBM Braille Reading Machine. Both experimental and control groups achieved significant gains in braille reading rate on motivated tests (monetary rewards offered for rate improvement).

McBride (1974) reported on one of several workshops he conducted on rapid reading for visually handicapped adults reading braille. The group received two weeks of training in techniques similar to those McBride uses for teaching normally-sighted readers (see Appendix A). The average reading rate of this group before the training was 138 WPM, and after the training was 710 WPM. One subject reportedly increased her rate from 144 WPM to 1,600 WPM. Comprehension was not measured by a formal test; subjects read prose fiction that they had not read before and reported on it orally. Comprehension level admittedly dropped somewhat according to McBride. McBride has taught several workshops in rapid reading for the visually handicapped throughout the United States; the earlier study by Wallace (1973) employed techniques of rapid reading training that he observed in one of these workshops. Wallace's braille group had a pre-test rate of 79.30 WPM and a post-test rate of 110.19 WPM for an approximate gain of 39%. His large print group increased

its rate from 138.47 WPM to 207.64 WPM for an approximate gain of 49%. Wallace used the survey section of the Diagnostic Reading Test as a formal measure of evaluation. Rate gains by both groups were significant, while no significant changes in comprehension were recorded for either group.

Crandell (1974) summarized the results of a workshop, taught by McBride, at Brigham Young University. All of the subjects in this workshop increased their reading rates (anywhere from two to five times) over the two-week period. These rate gains were obtained by informal testing only; consequently, no comprehension data was available. Readers participating in this workshop, who were better readers initially, improved the most after training. According to Crandell, major criticisms of the training were: (1) the method has not been demonstrated with visually handicapped children, only adults; (2) there is insufficient evidence to support the hypothesis that the braille reader will better his speed, since only a few seem to obtain the high speeds publicized; (3) since students attending these workshops pay their own tuition and expenses and are presumably highly motivated, results may reflect levels of motivation rather than a true teaching method.

Summary

A complete evaluation of rapid or "speed" reading training for normally-sighted readers is exceedingly difficult due to several unsettled controversies. The reading process is so complex that it is impossible to know what really happens when someone reads at "phenomenal speeds." Some reading experts would discount it as a type of skimming, and not reading in the true sense. Regardless of what the process is,

there is no apparent agreement among those teaching rapid reading as to the limits of human perceptual ability; Spache (1962) would put a ceiling of 800-900 WPM on achievable rates, while others believe it is possible to read as fast as we think. A comparison of reported rate gains from various studies on rapid reading is not realistic, because studies differ on the following: (1) materials used during training (type, level of difficulty, format); (2) motivation and purposes for reading more rapidly; (3) quality of the comprehension questions and/or tests; and (4) background and/or abilities of the subjects. The role of subvocalization in the reading process is not clear. It remains to be understood whether "good readers" who use inner speech developed because of it or in spite of it. Machines have been used to train for rapid reading with variable success; it appears that machines provide the needed motivation for some to improve their reading rates, while they do not accomplish this for others. Further investigation into retention of rate gains is indicated.

Despite the similarity claimed to exist between tactual and visual reading, large print and braille reading have characteristically been less efficient modes of reading than standard print. It has been shown by a number of studies that braille and large print reading rates can both be significantly increased by rapid reading techniques (similar to those taught normally sighted readers). When trying to compare studies on rapid reading for the visually handicapped, the same difficulties arise as were previously mentioned for the normally sighted. There is little that can be concluded regarding the efficacy of rapid reading training, until experimental procedures become more standardized.

CHAPTER III

DESIGN OF THE STUDY

Introduction

The procedures of the present research will be explained in this chapter. A discussion of the following topics will be included: sources of data, research population, and treatment of the data.

Planning the Investigation

A review of the literature revealed that rapid reading training for normally sighted print readers is surrounded by controversies as to its efficacy. A lack of standardization of procedures used in studies has made a complete evaluation of rapid reading impossible to the present time. Recently, techniques of rapid reading have been employed by McBride (1974) with visually handicapped braille and large print readers. Prior to the time of this study, no formal measure of rate or comprehension change had been employed in McBride's rapid reading workshops for the visually handicapped. Wallace (1973), using rapid reading techniques described by McBride, found significant rate gains with no comprehension change on a formal test; the rate gains were considerably more conservative, however, than those reported by McBride. Consequently, this study was planned to determine the effect of McBride's rapid reading techniques on the reading rates and comprehension of braille and large print readers as measured by formal and informal

tests, comparing a group trained by McBride with groups trained by the researcher (using McBride's techniques).

Sources of Data

The data utilized in this study was gathered at: (1) a workshop of braille readers taught by Vearl McBride in rapid reading August 5-16, 1974, in Canton, Missouri, and (2) a workshop of braille and large print readers taught by the researcher September 16-27, 1974, in Grand Forks, North Dakota.

The Missouri braille group and the North Dakota braille and large print groups were tested before and after approximately sixteen hours of rapid reading training (see Appendix B) given over two-week periods. Testing procedures included both informal and formal measures as described below:

1. Informal: Each individual chose prose fiction at his appropriate reading level and was given several one-minute timings to read this material silently before and after the training. Following each timing, the number of words read were counted and individuals reported orally on what they had read. The timing during which the reader felt he achieved book report comprehension (80% or better) was the one recorded as the pre-test informal or post-test informal rate.

2. Formal: Spache's Diagnostic Reading Scales (silent reading portion) was individually administered by the researcher to all subjects in each of the three groups. The wordlists were used to find each reader's approximate reading level. Each person was then asked to silently read three passages from the test (one below, one at and one above the approximate reading level). The number of words in each

passage were counted and divided by the minutes taken to read it. Comprehension was recorded as a percentage of questions answered out of the total given at the end of each passage (seven or eight). A pre-test formal rate, post-test formal rate, pre-test formal comprehension, and post-test formal comprehension were recorded for each reader as an average of the three rate and percentage scores obtained on the pre-test and post-test.

Instruments

Informal Test

See Appendix C for a list of fictional books read for testing and training during the two-week workshops.

Formal Test

Reading rate and comprehension were measured by the silent reading portion of Spache's Diagnostic Reading Scales. A review of this inventory is given by Bryant (1968) in Buros' Reading Tests and Reviews. The three word lists utilized in grade level placement, according to Bryant, have reasonable reliability (.96, .86, .91) using the Kuder-Richardson formula 21. Word recognition norms provide grade level scores of 1.3 to 6.5. Only immediate responses are considered correct; norms should perhaps be obtained for untimed recognition as well. The two selections available at each of the grade levels 1.6, 1.8, 2.3, 3.3, 3.8, 4.5, 5.5, 6.5, 7.5, and 8.5 were graded by readability formulas reflecting vocabulary and sentence length. Silent reading level and auditory comprehension are based upon short-answer type questions (seven or eight) following each selection. A reliability of .84 to

.88 was obtained by the test-retest method. Bryant points out that memory can enter into the performance on the retest, therefore, the reliability coefficients are not completely reassuring. He further suggests a need for a manual with difficulty indices on test items administered without reading the selections, as well as when normal administration is used. Despite the minor difficulties and need for a more systematic and effective manual, Bryant would classify the Diagnostic Reading Scales as one of the most meaningful and quickly obtainable approaches presently available for diagnosis of reading skills and difficulties. According to validity reports, results of the test are similar to those obtained by the California Reading Tests and ratings by first grade teachers.

Research Population

The fifteen subjects, comprising the Missouri braille group and trained by Vearl McBride, ranged in age from 19-62 and had a mean age of 38.60 years. They came from twelve different states and Canada (see Table 1). Individuals in this group, having heard of other rapid reading workshops conducted by McBride for the visually handicapped, paid tuition and living expenses to attend the two-week workshop in August, 1974, at Canton, Missouri.

The subjects in the North Dakota braille group (N=12) ranged in age from 10-65 and had a mean age of 34.17 years. The North Dakota large print group (N=10) ranged in age from 10-19 and had a mean age of 13.50 years. Both North Dakota groups (see Tables 2 and 3) were trained by the researcher and were: (1) students in grades 4-12 enrolled at the North Dakota State School for the Blind; (2) adults

TABLE 1

DESCRIPTIVE DATA ON READERS OF THE MISSOURI BRAILLE GROUP

Subject	Sex	Age	Occupation
A	F	37	rehabilitation teacher
B	F	40	teacher-multi-handicapped
C	F	61	housewife
D	M	43	teacher of visually hand.
E	F	33	rehabilitation teacher
F	F	56	braille teacher
G	M	44	rehabilitation teacher
H	F	25	college student
I	F	38	public school teacher
J	F	28	rehabilitation teacher
K	F	25	resource teacher
L	F	19	college student
M	M	31	computer programmer
N	F	37	teacher-multi-handicapped
O	M	62	rehabilitation teacher

NOTE: States represented by the above individuals were Arkansas, California, Connecticut, Iowa, Kansas, Maryland, New York, North Carolina, Oklahoma, Pennsylvania and Maryland. Alberta, Canada was also represented.

TABLE 2

DESCRIPTIVE DATA ON READERS OF THE NORTH DAKOTA BRAILLE GROUP

Subject	Sex	Age	Occupation
A	M	14	student (elementary)
B	F	24	student (college)
C	F	65	retired
D	M	15	student (high school)
E	F	59	housewife
F	F	15	student (high school)
G	M	59	retired
H	F	40	student (college)
I	F	47	teacher-visually hand.
J	F	50	housewife
K	F	10	student (elementary)
L	M	12	student (elementary)

TABLE 3

DESCRIPTIVE DATA ON READERS OF THE NORTH DAKOTA LARGE PRINT GROUP

Subject	Sex	Age	Occupation
M	F	19	student (college)
N	F	16	student (high school)
O	M	12	student (elementary)
P	M	10	student (elementary)
Q	F	15	student (high school)
R	M	11	student (elementary)
S	M	12	student (elementary)
T	F	15	student (high school)
U	M	15	student (elementary)
V	F	10	student (elementary)

NOTE: Elementary students are those in grade levels 4-8; high school students are those in grade levels 9-12.

residing in Grand Forks, North Dakota, or (3) adults from the surrounding geographical area residing temporarily in Grand Forks for rehabilitation services. There was no cost in the form of tuition or living expenses for any individual in the two North Dakota groups. Furthermore, subjects in these groups were recruited to participate in the training by the researcher. They continued to attend school, work at jobs, or carry on normal routines of their daily living.

Treatment of the Data

Hypotheses one through six and eight were evaluated by t tests. Hypothesis seven was tested by an analysis of variance. An analysis of covariance was used for hypothesis nine. An intercorrelation matrix was employed for hypotheses ten and eleven.

CHAPTER IV

ANALYSIS OF THE DATA

An analysis of the data pertaining to each hypothesis will be presented in this chapter. The order of presentation for the findings follows that of Chapter I. A statement of the research hypotheses (null form) to be tested introduces each of the eleven sections of the data analysis. Hypotheses one through six and eight were evaluated by t tests. Hypothesis seven was assessed by the analysis of variance. An analysis of covariance was used for hypothesis nine. An intercorrelation matrix was employed for hypotheses ten and eleven.

Hypothesis Number One

There is no significant change in reading rate, measured informally, after training in rapid reading for:

- a. Missouri braille group
- b. North Dakota braille group
- c. North Dakota large print group

Table 4 presents means and related t values for each of the three groups. For significance at the .01 level, the following t values were needed: (1) Missouri braille group with 14 degrees of freedom, t value of 2.98; (2) North Dakota braille group with 11 degrees of freedom, t value of 3.11; and (3) North Dakota large print group with 9 degrees of freedom, t value of 3.25.

TABLE 4
MEANS AND t VALUES FOR GAINS IN INFORMAL RATE

Variable	Group	Means	t	p
Informal pre-test rate	Missouri braille	97.87	4.43	.01
Informal post-test rate		274.67		
Informal pre-test rate	N. Dak. braille	76.75	4.60	.01
Informal post-test rate		202.92		
Informal pre-test rate	N. Dak. large print	115.10	3.49	.01
Informal post-test rate		334.30		

Null hypothesis one is thus rejected in that each of the three groups significantly increased its reading rate as measured by the informal test after training in rapid reading.

Hypothesis Number Two

There is no significant change in reading rate, measured formally, after training in rapid reading for:

- a. Missouri braille group
- b. North Dakota braille group
- c. North Dakota large print group

Means and related t values for each of the three groups are shown in Table 5. The t value required for significance at the .05 level for the North Dakota large print group was 2.14.

Null hypothesis two is rejected in that all three groups made significant increases after rapid reading training on the formal test of rate. The two braille groups received increases significant at the .01 level, while the large print group's rate increase was significant at the .05 level.

TABLE 5
MEANS AND t VALUES FOR GAINS IN FORMAL RATE

Variable	Group	Means	t	p
Formal pre-test rate	Missouri braille	93.38	5.20	.01
Formal post-test rate		121.07		
Formal pre-test rate	N. Dak. braille	78.57	3.87	.01
Formal post-test rate		119.87		
Formal pre-test rate	N. Dak. large print	90.58	2.64	.05
Formal post-test rate		145.85		

Hypothesis Number Three

There is no significant change in comprehension, measured formally, after training in rapid reading for:

- a. Missouri braille group
- b. North Dakota braille group
- c. North Dakota large print group

Table 6 contains the means and related t values for each of the three groups.

TABLE 6
MEANS AND t VALUES FOR CHANGES IN COMPREHENSION

Variable	Group	Means	t	p
Pre-test comp.	Missouri braille	89.44	-.99	N.S.
Post-test comp.		85.94		
Pre-test comp.	N. Dak. braille	83.33	.85	N.S.
Post-test comp.		85.74		
Pre-test comp.	N. Dak. large print	75.42	3.00	.05
Post-test comp.		86.75		

Parts a and b of null hypothesis three are retained, since no significant change in comprehension occurred for either braille group after rapid reading training. Part c of this hypothesis is rejected in that the large print group made a gain in comprehension at the .05 level.

Hypothesis Number Four

There is no significant difference between the informal and formal pre-test measures of rate for:

- a. Missouri braille group
- b. North Dakota braille group
- c. North Dakota large print group

Means and t values for each of the three groups is presented in Table 7.

TABLE 7
MEANS AND t VALUES FOR COMPARING INFORMAL AND FORMAL PRE-TESTS
OF RATE

Variable	Group	Means	t	p
Pre-test rate	Missouri braille			
Informal		97.87		
Formal		83.38	1.89	N.S.
Pre-test rate	N. Dak. braille			
Informal		76.75	-.28	N.S.
Formal		78.57		
Pre-test rate	N. Dak. large print			
Informal		115.10	1.58	N.S.
Formal		90.58		

Null hypothesis four stands in its entirety, since there were no significant differences between informal and formal pre-test rates for any of the three groups.

Hypothesis Number Five

There is no significant difference between the informal and formal post-test measures of rate for:

- a. Missouri braille group
- b. North Dakota braille group
- c. North Dakota large print group

Given in Table 8 are means and related *t* values for each of the three groups. The following *t* values were required for significance at the .001 level: (1) Missouri braille group with 14 degrees of freedom, *t* value of 4.14; (2) North Dakota braille group with 11 degrees of freedom, *t* value of 4.44; and (3) North Dakota large print group with 9 degrees of freedom, *t* value of 4.78.

TABLE 8

MEANS AND *t* VALUES FOR COMPARING INFORMAL AND FORMAL POST TESTS OF RATE

Variable	Group	Means	<i>t</i>	<i>p</i>
Post-test rate	Missouri braille			
Informal		274.67	4.33	.001
Formal		121.07		
Post-test rate	N. Dak. braille			
Informal		202.92	3.82	.01
Formal		119.87		
Post-test rate	N. Dak. large print			
Informal		334.30	3.55	.01
Formal		145.85		

Null hypothesis five is rejected completely in that significant differences were found between informal and formal post tests of rate at the .001 level for the Missouri group, and at the .01 level for the two North Dakota groups.

Hypothesis Number Six

There is no significant difference between informal rates predicted before rapid reading training and informal rates achieved after training for:

- a. Missouri braille group
- b. North Dakota braille group
- c. North Dakota large print group

Table 9 presents means and related t values for each of the three groups.

TABLE 9

MEANS AND t VALUES FOR COMPARING INFORMAL RATES PREDICTED AND ACHIEVED

Variable	Group	Means	t	p
Informal rates	Missouri braille			
Predicted		312.67	.87	N.S.
Achieved		274.67		
Informal rates				
Predicted		209.08	1.04	N.S.
Achieved		202.92		
Informal rates	N. Dak. large print			
Predicted		443.10	1.52	N.S.
Achieved		334.30		

Null hypothesis six cannot be rejected since there were no significant differences found for any of the three groups between rates predicted and actual rates achieved as measured by informal tests.

Hypothesis Number Seven

There is no significant difference among the three groups on the following variables:

- a. age
- b. sex
- c. years of education
- d. predicted rate before rapid reading training
- e. pre-test rate (measured informally)
- f. pre-test rate (measured formally)
- g. post-test rate (measured informally)
- h. post-test rate (measured formally)
- i. pre-test comprehension (measured formally)
- j. post-test comprehension (measured formally)
- k. percentage increase in rate (measured informally)
- l. percentage increase in rate (measured formally)
- m. percentage change in comprehension (measured formally)
- n. minutes practiced
- o. percentage satisfaction with results of training
- p. percentage of success in rapid reading due to motivation

Table 10 contains means, standard deviations and F values for differences among the three groups on designated variables. An F value of 3.28 was required for significance at the .05 level; at the .01 level an F value of 5.29 was needed; for significance at the .001 and .0005 levels, F values of 8.56 and 9.64 were needed respectively.

From data in Table 10 it is seen that significant differences existed among the three groups on variables of age ($p < .001$), years of education ($p < .0005$), percentage increase in comprehension after training ($p < .05$), and minutes practiced outside the training sessions ($p < .0005$). The remaining parts of null hypothesis seven stand, since no significant differences were found among the three groups on variables of sex, predicted rates, informal pre-test rates, formal pre-test rates, formal pre-tests of comprehension, informal post-test rates, formal post-test rates, percentage increase in formal rates, percentage satisfaction with results of training, or percentage of success attributed to motivation.

TABLE 10

MEANS, STANDARD DEVIATIONS AND F VALUES FOR DIFFERENCES AMONG THE THREE GROUPS

Variable	Missouri Braille		N. Dak. Braille		N. Dak. Large Print		F	P
	Mean	S.D.	Mean	S.D.	Mean	S.D.		
Age	38.60	12.99	34.17	21.22	13.50	2.95	9.27	.001
Sex	.27	.46	.33	.49	.50	.53	.70	N.S.
Yrs. of Ed.	16.40	2.17	10.75	3.79	7.00	3.20	30.09	.0005
Pred. Inf. Rate	312.67	223.94	209.08	219.84	443.10	349.65	2.18	N.S.
Pre-test For. Rate	97.87	61.14	76.75	55.89	115.10	79.95	.96	N.S.
Pre-test For. Comp.	93.38	61.87	78.57	50.58	90.58	44.99	.27	N.S.
Post-test Inf. Rate	89.44	10.07	83.33	17.11	75.42	16.92	2.79	N.S.
Post-test For. Rate	274.67	208.50	202.92	133.10	334.30	232.26	1.26	N.S.
Post-test For. Comp.	121.07	80.80	119.87	84.73	145.85	94.26	.32	N.S.
Percentage Inc.	85.94	8.49	85.74	12.92	86.75	13.04	.02	N.S.
Percentage Inc. For. Rate	200.40	167.95	202.67	131.70	219.60	187.08	.05	N.S.
Percentage Inc. For. Rate	30.18	17.20	44.90	27.85	62.39	58.73	2.43	N.S.
Percentage Change For Comp.	-2.61	14.99	5.71	17.25	20.51	30.79	3.66	.05
Minutes of Practice	1644.60	459.58	302.67	183.11	248.60	123.16	81.85	.0005
Percentage Satisfaction	65.00	18.42	58.33	28.87	75.00	31.18	1.14	N.S.
Percentage of Success Due to Motivation	58.33	22.49	54.17	20.87	62.50	17.68	.44	N.S.

Hypothesis Number Eight

There is no significant difference between the two braille groups on variables listed under hypothesis seven or additionally:

- q. number of hands used in reading braille
- r. number of fingers used in reading braille
- s. number of years of braille reading
- t. number of years of print reading

Presented in Table 11 are means, standard deviations and t values for differences between the two braille groups on the designated variables. Following are the related t values needed for significance at the .05, .01, .001, and .0005 levels respectively: 2.06, 2.78, 3.71, and 3.93.

Significant differences were found between the two braille groups on years of education ($p < .0005$), percentage increase in formal rate ($p < .01$), minutes practiced outside the training sessions ($p < .0005$), and the number of hands used during braille reading ($p < .05$). Null hypothesis eight is retained for the following variables: age, sex, predicted rates, informal pre-test rates, formal pre-test rates, formal pre-test comprehension, informal post-test rate, formal post-test rate, formal post-test comprehension, percentage increase in informal rate, percentage change in comprehension, percentage satisfaction with results of training, percentage of success due to motivation, number of fingers used during braille reading, number of years of braille reading, or number of years of print reading.

TABLE 11

MEANS, STANDARD DEVIATIONS AND t VALUES FOR DIFFERENCES BETWEEN THE BRAILLE GROUPS

Variable	Missouri Braille		N. Dak. Braille		t	p
	Mean	S.D.	Mean	S.D.		
Age	38.60	12.99	34.17	21.22	.45	N.S.
Sex	.27	.46	.33	.49	.13	N.S.
Yrs. of Ed.	16.40	2.17	10.75	3.79	23.77	.0005
Pred. Inf. Rate	312.67	223.94	209.08	219.94	1.45	N.S.
Pre-test Inf. Rate	97.87	61.14	76.75	55.89	.86	N.S.
Pre-test For. Rate	93.38	61.87	78.57	50.58	.45	N.S.
Pre-test For. Comp.	89.44	10.07	83.33	17.11	1.34	N.S.
Post-test Inf. Rate	274.67	208.50	202.92	133.10	1.07	N.S.
Post-test For. Rate	121.07	80.80	119.87	84.73	.00	N.S.
Post-test For. Comp.	85.94	8.49	85.74	12.92	.00	N.S.
Percentage Inc.	200.40	167.95	202.67	131.70	.00	N.S.
Inf. Rate						
Percentage Inc.	30.18	17.20	44.90	27.85	2.81	.01
For. Rate						
Percentage Change	-2.61	14.99	5.71	17.25	1.80	N.S.
For. Comp.						
Minutes of Practice	1644.60	459.58	302.67	183.11	90.24	.0005
Percentage Satisfaction	65.00	18.42	58.33	28.87	.53	N.S.
Percentage of Success	58.33	22.49	54.17	20.87	.24	N.S.
Due to Motivation						
No. of Hands Used	.47	.52	.75	.45	2.24	.05
No. of Fingers Used	.60	.51	.83	.39	1.72	N.S.
Yrs. of Braille Reading	21.47	14.49	18.58	15.85	.24	N.S.
Yrs. of Print Reading	10.00	13.73	8.92	17.63	.03	N.S.

Hypothesis Number Nine

There is no significant difference among the three groups on the following post-test measures after covariance techniques have been applied to pre-tests of:

- a. rate (measured informally)
- b. rate (measured formally)
- c. comprehension (measured formally)

F values and adjusted means after the analysis of covariance are given in Table 12.

TABLE 12
F VALUES AND ADJUSTED MEANS AFTER THE ANALYSIS OF COVARIANCE

Variable	Group	Adjusted Means	F	p
Post-test				
Informal rate	Missouri braille	271.76	.32	N.S.
	N. Dak. braille	247.24		
	N. Dak. large print	292.87		
Post-test				
Formal rate	Missouri braille	112.59	2.20	N.S.
	N. Dak. braille	132.78		
	N. Dak. large print	141.42		
Post-test				
Formal comp.	Missouri braille	83.75	.69	N.S.
	N. Dak. braille	85.54		
	N. Dak. large print	89.14		

Null hypothesis nine stands on the basis of data in Table 11.

No significant difference was found among the groups on post-test measures of informal rate, formal rate, or formal comprehension after an analysis of covariance was performed using pre-tests as covariates. Apparently, the comparatively low pre-test comprehension score of the

large print group and the lower pre-test formal rate score of the North Dakota braille group are responsible for the significant differences found on the analysis of variance (hypotheses eight and nine).

Hypothesis Number Ten

There is no significant correlation between any two variables as listed under hypotheses seven for the three groups.

Table 13 presents a legend of the twenty variables in this study; the first sixteen are under consideration for this hypothesis. Table 14 presents correlation coefficients between variables for the three groups.

It can be seen from Table 14 that the only variable not correlated significantly to any other is percentage success attributed to motivation. On the remaining variables, for which null hypothesis ten is rejected, only those having some useful interpretability will be mentioned.

Age was found to be positively correlated with pre-test formal comprehension and minutes practiced, while it was negatively correlated to percentage increase in both informal and formal rate. Years of education was positively correlated with pre-test formal comprehension and minutes practiced, but negatively correlated to percentage change in comprehension. Predicted rate was positively correlated to pre-test informal rate, pre-test formal rate, post-test informal rate, post-test formal rate, and percentage change in comprehension. Pre-test informal rate was positively correlated with post-test informal and with post-test formal rate. Pre-test formal rate was positively correlated to post-test formal and post-test informal rate. Pre-test formal comprehension was positively correlated to minutes practiced

TABLE 13
LEGEND FOR VARIABLES IN TABLES 14 AND 15

-
1. Age
 2. Sex [Male = 1, Female = 0]
 3. Years of education
 4. Predicted rate before training
 5. Informal pre-test rate
 6. Formal pre-test rate
 7. Informal post-test rate
 8. Formal post-test rate
 9. Formal pre-test comprehension
 10. Formal post-test comprehension
 11. Percentage increase in informal rate
 12. Percentage increase in formal rate
 13. Percentage change in comprehension
 14. Minutes practiced
 15. Percentage satisfaction with results
 16. Percentage of success due to motivation
 17. Number of hands used in reading braille [2 hands = 1, 1 hand = 0]
 18. Number of fingers used in reading braille [2 or more fingers = 1,
1 finger = 0]
 19. Number of years of braille reading
 20. Number of years of print reading
-

TABLE 14
CORRELATIONS BETWEEN VARIABLES FOR ALL THREE GROUPS

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	-.18	.68	-.04	-.03	-.01	-.13	-.10	.32	.20	-.32	-.33	-.25	.53	-.26	-.10
2		-.32	-.27	-.22	-.20	-.22	-.15	-.02	-.07	-.08	.21	-.04	-.12	-.22	.20
3			.18	.16	.24	.18	.15	.39	.08	.07	-.24	-.35	.73	-.12	-.23
4				.80	.68	.76	.62	-.31	.08	-.00	.06	.36	.08	.18	-.10
5					.88	.76	.79	-.25	.00	-.25	.05	.22	.04	.09	-.12
6						.82	.90	-.30	-.05	-.12	.06	.23	.05	.18	-.19
7							.84	-.24	-.12	.28	.24	.18	.03	.22	-.11
8								-.23	-.22	.00	.44	.07	-.08	.12	-.25
9									.38	-.17	-.04	-.86	.32	-.38	-.09
10										-.45	-.42	.10	.06	.01	-.04
11											.23	.03	.12	.24	.04
12												-.20	-.30	.04	-.10
13													-.31	.43	.12
14														-.01	.08
15															.18
16															

$r = .42$ (.01 level)
 $r = .32$ (.05 level)

with results. Post-test formal comprehension was negatively correlated with percentage increase in both informal and formal rate.

Hypothesis Number Eleven

There is no significant correlation between any two variables listed under hypotheses seven or eight for the two braille groups.

Table 15 contains correlation coefficients between variables for the two braille groups. It is evident from this table that null hypothesis eleven cannot be retained for any parts except involving variables of percentage satisfaction with results and percentage of success attributed to motivation. Again, only those correlations offering some useful interpretation will be mentioned.

Age was found to be negatively correlated to percentage increase in informal rate. Years of education was positively correlated with pre-test formal comprehension and minutes practiced; it was negatively correlated to percentage change in formal comprehension. Predicted rate was positively correlated to pre-test informal rate, pre-test formal rate, post-test informal rate, post-test formal rate, and number of years of braille. Pre-test informal rate was positively correlated with post-test informal rate, post-test formal rate, and number of years of braille, but was negatively correlated to the number of years of print. Pre-test formal rate was positively correlated to post-test informal rate, post-test formal rate, number of fingers used during braille reading, and number of years of print. Post-test informal rate was positively correlated to the number of years of braille but negatively correlated to the number of years of print. Post-test formal rate was positively correlated to the number of fingers used

TABLE 15
CORRELATIONS BETWEEN VARIABLES FOR BRAILLE GROUPS

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	-.06	.50	.17	.10	-.01	-.07	-.06	.23	.33	-.49	-.36	-.09	.35	-.24	-.03	-.29	-.20	.55	.54
2		-.18	-.16	-.12	-.08	-.06	-.06	-.19	-.10	.02	.13	.19	-.03	-.16	.28	-.12	-.29	.09	.54
3			.41	.35	.26	.27	.21	.40	.19	-.25	-.12	-.38	.68	-.04	-.21	-.15	-.16	.41	.15
4				.76	.72	.74	.71	-.09	.09	-.15	.15	.09	.31	.08	-.27	.34	.36	.54	-.31
5					.95	.87	.91	-.15	.15	-.28	.09	.19	.17	.15	-.25	.28	.33	.60	-.44
6						.87	.97	-.33	.02	-.18	.15	.33	.07	.17	-.30	.27	.40	.55	-.52
7							.86	-.20	-.13	.09	.19	.07	.16	.15	-.16	.24	.36	.38	-.42
8								-.37	-.08	-.12	.36	.31	-.03	.17	-.32	.30	.45	.52	-.54
9									.52	-.17	-.25	-.84	.26	-.32	-.00	-.07	-.24	-.07	.30
10										-.70	-.44	-.00	.10	-.21	-.16	.06	-.18	.17	.19
11											.31	-.22	-.14	.22	.20	-.02	.27	-.41	-.13
12												.04	-.34	.20	-.08	.29	.39	-.05	-.33
13													-.25	.27	-.00	.14	.15	.11	-.19
14														.12	.16	-.19	-.29	.15	.20
15															.03	.27	.34	-.12	-.14
16																.08	-.18	-.23	.14
17																	.78	.14	-.22
18																		.12	-.32
19																			
20																			-.39

$r = .49$ (.01 level)

$r = .38$ (.05 level)

during braille reading and the number of years of braille; it was negatively correlated to the number of years of print. Post-test formal comprehension was negatively correlated to percentage increase in both informal and formal rate. Percentage increase in informal rate was negatively correlated to the number of years of braille. Percentage increase in formal rate was positively correlated to the number of fingers used during braille reading.

Chapter IV has presented an analysis of the data. Chapter V subsequently presents a summary of the investigation, a discussion of the findings, the conclusions based on results of the study, recommendations for teaching and further research, and general implications of the study.

CHAPTER V

SUMMARY, DISCUSSION, CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS

Summary

The purpose of this study was to determine the effects of rapid reading training (as described by McBride, 1974) on the reading rates and comprehension of large print and braille readers. Of specific interest were comparisons among a group taught by McBride and two taught by the researcher under McBride's tutelage. Furthermore, it was a purpose of this study to investigate differences that exist between informal and formal tests given before and after the sixteen hours of rapid reading training. Informal testing consisted of oral reporting on individually chosen prose fiction to achieve an estimated "book report" comprehension. Formal testing consisted of reading appropriate silent reading paragraphs from Spache's Diagnostic Reading Scales.

Fifteen braille-reading adults, ages 19-62 and with a mean age of 38.6 years, composed McBride's rapid reading group. These adults came from twelve different states and Canada for a two-week workshop held August 5-16, 1974, in Canton, Missouri. They voluntarily enrolled in the workshop and paid their own tuition and living expenses to attend. Twelve braille readers, ages 10-65 and with a mean age of 34.2 years, made up the first group taught by the researcher; the

second group were large print readers, ages 10-19 and with a mean age of 13.5 years. Both of these latter groups were recruited from the North Dakota State School for the Blind and surrounding communities at no personal cost to any member. This workshop was held September 16-27, 1974, in Grand Forks, North Dakota.

Summary and Discussion of Findings

Presented in this section are the eleven hypotheses under consideration in this study. Each hypothesis is followed by a summary and a discussion of the results pertaining to it.

Hypothesis Number One

There is no significant change in reading rate, measured informally, after training in rapid reading for:

- a. Missouri braille group
- b. North Dakota braille group
- c. North Dakota large print group

Significant increases in rate were achieved by all three groups at the .01 level. The greatest gain in rate was made by the large print group which had an informal pre-test rate of 115.10 WPM and an informal post-test rate of 334.30 WPM. The Missouri braille group attained the next highest gain with an informal pre-test rate of 97.87 WPM and an informal post-test rate of 274.67 WPM. The informal pre-test rate of the North Dakota braille group was 76.75 WPM, while the informal post-test rate was 202.92 WPM.

The reading rates achieved by the three groups in this study were well within the range that Spache (1962) places on the perceptual ability of sighted readers (800-900 WPM). This was true, not only for group averages, but individually achieved rates as well (see Appendix D).

A few individual braille readers, in each of the groups in this study, exceeded the maximum sweep rate of 320 WPM calculated by Grunwald (1966) for braille reading. It is not clear from Grunwald's description of his simulated reading experiments how they might differ from the experimental conditions of this study. The informal pre-test rate (138 WPM) of the group of braille readers, involved in an earlier workshop taught by McBride (1974), was considerably higher than the pre-test rate of either of the two braille groups in this study. Similarly, the post-test rate (710 WPM) of this earlier group was higher. Informal rate increases of the present study are consonant with Crandell's (1974) report of McBride's workshop results at Brigham Young University. Braille and large print readers achieved rates two to five times greater than their initial reading rates after training at this workshop.

Hypothesis Number Two

There is no significant change in reading rate, measured formally, after training in rapid reading for any of the three groups in the study.

The two braille groups showed significant gains in rate at the .01 level after rapid reading training. The formal pre-test rate of the North Dakota braille group was 78.57 WPM, and the formal post-test rate was 119.87 WPM. Thus, the rate gain made by this group was greater than that made by the Missouri braille group, which had a formal pre-test rate of 93.38 WPM and formal post-test rate of 121.07 WPM. Although the formal rate gain made by the large print group was greater than either of the braille groups' gain (formal pre-test = 90.58 WPM, formal post-test = 145.85 WPM), it was significant only at the .05 level. This might be explained by the greater amount of variation in rate gains made within this group as well as the smaller number of subjects in the group.

The pre- and post-test reading rates of braille readers in Wallace's (1973) study were strikingly similar to those found in this study. This is particularly of interest, since Wallace also used a formal test in his evaluation of rapid reading techniques that he described as similar to McBride's. The pre-test rate of Wallace's braille group was 79.30 WPM, while their post-test rate was 110.19 WPM. The large print group he tested had a pre-test rate (137.47 WPM) considerably higher than that of the large print group in this study. The post-test rate (201.64 WPM) achieved by Wallace's large print group was also much higher than the post-test rate found for the North Dakota large print group.

Hypothesis Number Three

There is no significant change in comprehension, measured formally, after training in rapid reading for any of the three groups in the study.

No significant change in comprehension, measured formally, took place for either of the two braille groups after rapid reading training. The Missouri braille group had a slight decrease in comprehension from a pre-test score of 89.44% to a post-test score of 85.94%. The North Dakota braille group had a pre-test comprehension score of 83.33% and showed an increase with a post-test score of 85.74%. The large print group had the lowest pre-test comprehension of the three groups (75.42%) and improved to 86.75% on the post-test; this gain was significant at the .05 level.

The findings of the present study are in keeping with those of Wallace (1973) for braille readers, in that comprehension remained

fairly constant after rapid reading training. While Wallace's large print group also had no significant change in comprehension after rapid reading training, the large print group of this study did make a significant gain in comprehension.

Hypothesis Number Four

There is no significant difference between the informal and formal pre-test measures of rate for any of the three groups in the study.

No significant difference was found between the informal and formal pre-test measures of rate for any of the three groups. Thus, despite the lack of an objective measure of comprehension on the informal pre-test, the rate at which individuals read was not appreciably different than when an objective test of comprehension was used. Furthermore, the test situation apparently did not have a "slowing down" effect on the pre-test rate, as one might expect when readers are anticipating questions about what they read.

Hypothesis Number Five

There is no significant difference between the informal and formal post-test measures of rate for any of the three groups in the study.

A significant difference at the .001 level was found between the informal and formal post-tests of rate for the large print group, while the two braille groups showed differences between these measures at the .01 level. Since there were no significant differences between the informal and formal pre-test rates, one might conclude that the training altered this similarity by the time of the post-tests. It is possible that the substantially greater rates on the informal post-test achieved because of lower comprehension levels. In an attempt to read

faster, readers may not have been truly reaching the estimated "book report" comprehension level of 80%. Another explanation for the discrepancy between post-test measures of rate might be that each test evoked a different kind of reading. The rapid reading training may have, in fact, taught individuals to suppress the unimportant words on a page as their eyes or fingers passed over them. This ability to suppress the unimportant would be particularly enhanced by the informal test situation, because prose fiction (without objective comprehension questions) were used as during the training sessions. On the other hand, the formal test may have diminished the ability to suppress unimportant details, in that readers may have searched for what was important to the person who wrote the comprehension questions. Some reading experts would discount this type of reading as "skimming" and not reading in the true sense. Fleming (1968), in commenting on the paucity of research on the skimming process, believes that for too long we have stressed careful, expressive reading to the neglect of developing good skimming techniques. He further points out that skimming is being able to adjust one's rate with discrimination, and that that is a key factor in becoming an effective reader.

Hypothesis Number Six

There is no significant difference between informal rates predicted before rapid reading and informal rates achieved after training for any of the three groups in the study.

No significant differences were found between informal rates predicted and informal rates achieved after rapid reading training for any of the three groups. Again, one might question whether

comprehension was sacrificed to fulfill a prophecy on the informal test. One can only speculate as to what actually occurred, but certainly motivation plays a large part in the success of rapid reading training. The prediction of rates hoped for may have contributed to that measure of motivation.

Hypothesis Number Seven

There is no significant difference among the three groups on any of the variables tested in this study.

Significant differences existed among the three groups on the variable of age at the .001 level. The Missouri braille group had the highest mean age (38.60), followed by the North Dakota braille group (34.17) and the large print group (13.50). There were significant differences on years of education among the three groups at the .005 level. Again, the Missouri braille group had the most years of education with a mean of 16.40, followed by the North Dakota braille groups (10.75 years) and the large print group (7.00 years). A significant difference at the .05 level existed among the groups on percentage change in comprehension after rapid reading training. Increases in comprehension were made by the large print group (20.51%) and the North Dakota braille group (5.71%), while the Missouri braille group decreased in comprehension by 2.61%. The three groups differed significantly ($p < .0005$) in the number of minutes of reading practice outside the training sessions. The Missouri braille group with a mean of 1644.60 minutes far exceeded the North Dakota braille group (302.67) minutes and the large print group (248.60 minutes). This is logical, since the rapid reading training at the Missouri workshop was the only activity in which readers were

engaged during that two-week period. The two North Dakota groups were recruited to participate in the training in addition to the routine of school or jobs.

It is interesting to note that despite differences in age, years of education, amount of practice time, and motivation for participating in the training, no significant differences were found among the groups on pre-test rate (formal or informal), post-test rate (formal or informal), pre- or post-test comprehension, percentage increases in rate (formal or informal), or percentage of success each of the three groups attributed to motivation. It would seem then, that the three groups were similar in their initial reading skills before rapid reading training. Furthermore, the training was reliable in its effect on reading rate. The amount of practice outside the training sessions did not seem to be an important factor toward increasing one's rate. Perhaps achieving a "minimum" of practice or a certain "quality" of practice was the important factor involved in raising one's reading rate.

The substantially greater increase in comprehension of the large print group must be interpreted with some caution. The relatively low pre-test comprehension level of this group may have contributed to this result. The F value of 2.79, for differences among the three groups on the pre-test of comprehension approached the F value needed for significance at the .05 level (3.28). This result is similar to that of Niday (1939) who found that braille readers had slightly better reading comprehension than print readers. On the other hand, the F value (.02) found for differences among the three groups of this study after rapid reading training, did not even approximate a significant F value.

Hypothesis Number Eight

There is no significant difference between the two braille groups on the variables tested in this study.

The Missouri braille group had significantly more years of education ($p < .0005$) and more minutes of practice outside the training sessions ($p < .0005$) than did the North Dakota braille group. The North Dakota braille groups used two hands for braille reading significantly more than the Missouri group ($p < .05$) and achieved a significantly greater increase in formal rate (44.90%) compared to the Missouri group (30.18%).

In comparing braille rate improvements, minutes of practice did not seem to affect success. The greater formal rate increase made by the North Dakota braille group must be looked upon critically in that the pre-test rate of this group was substantially lower than the Missouri braille group's. Although previous research seems to indicate that two-handed braille readers read faster than one-handed braille readers (Maxfield, 1928; Foulke and Lappin, 1973), one cannot assume that this factor contributed to the greater percentage increase in formal rate made by the North Dakota group. Furthermore, the gains in rate, measured informally, did not significantly differ.

Hypothesis Number Nine

There is no significant difference among the three groups on the following post-test measures after covariance techniques have been applied to pre-tests of:

- a. rate (measured informally)
- b. rate (measured formally)
- c. comprehension (measured formally)

No significant difference was found among the groups on post-test measures of informal rate, formal rate, or formal comprehension after an analysis of covariance was performed using pre-tests as covariates. The comparatively low pre-test comprehension score of the large print group was perhaps responsible for the significant difference found on that variable under hypothesis eight. Also, the relatively low pre-test formal rate of the North Dakota braille group may account for the significant difference found on that variable under hypothesis nine.

Hypothesis Number Ten

There is no significant correlation between any two variables tested under hypothesis seven for the three groups.

Age was positively correlated to pre-test formal comprehension and minutes practiced, but it was negatively correlated to percentage increase in both informal and formal rate. Thus, the older readers initially had greater comprehension; after training, this was not so. It would seem that rapid reading training may have had an "equalizing effect" on comprehension level. One might expect that the older readers would practice more, but it is interesting to note that they received smaller increases in rate than younger readers. This finding is consonant with the conclusions of Fertsch (1946). One of his findings was that reading habits are established prior to the third grade for most blind children.

Years of education was positively correlated to pre-test formal comprehension and minutes practiced, but negatively correlated to percentage change in comprehension. One might expect that more education would produce higher levels of comprehension, however, this was true only before rapid reading training and not after it. One could

speculate that the more education an individual had, the more concerned he was with improving (more practice time) and the less room there was for improving comprehension.

Predicted rate was positively correlated to pre-test formal rate, pre-test informal rate, post-test informal rate, post-test formal rate, and percentage change in comprehension. Higher predictions were made by those readers who had the faster initial rates, which perhaps reflects their level of confidence in themselves. Those predicting higher rates before training tended to have faster rates after training and increased their level of comprehension more as well. Again, prediction of rates may have been a motivating factor for some readers.

Pre-test informal rate was positively correlated to both informal and formal post-tests of rate. Pre-test formal rate was also positively correlated to informal and formal post-tests of rate. This means that those who were the faster readers before training were also the faster readers after training. It is interesting to note, however, that informal and formal increases in rate were not significantly related to initial reading rates. One might conclude that initial reading speed was not a predictor of success in rate improvement after rapid reading training. Such a conclusion would be in disagreement with a report (Crandell (1974) made on a workshop at Brigham Young University taught by McBride. Although Crandell's evaluation of this workshop was based on informal test data only, he proposed a positive relationship between initial reading speed and rate improvement achieved after the rapid reading training.

Pre-test formal comprehension was positively correlated to minutes of practice and negatively correlated to percentage satisfaction

with results. Readers who achieved the higher levels of comprehension were also those who spent more time practicing. Since it has already been seen that the amount of practice time was unrelated to rate improvements, these readers perhaps felt their extra time had been poorly invested.

Post-test formal comprehension was negatively correlated with percentage increase in both informal and formal rate. It would seem that as readers made rate increases, they simultaneously decreased their comprehension on the formal test, even though this decrease was determined to be non-significant.

The lack of significant correlations between sex and other variables of pre-test rates, post-test rates, pre-test comprehension, post-test comprehension, or percentage increase in informal and formal rates indicates that males and females were similar in their initial reading skills and benefited to the same degree from rapid reading training. On two previous studies (Niday, 1939; Umsted, 1972), female braille readers read faster and with better comprehension than male braille readers.

Hypothesis Number Eleven

There is no significant correlation between any two variables as listed under hypotheses seven or eight for the two braille groups.

Age was found to be negatively correlated to percentage increase in informal rate. A negative correlation ($-.36$) existed between age and percentage increase in formal rate as well, however, it did not quite reach the value needed for significance at the .05 level ($-.38$). Again, one might conclude that habits established over time interfere with increasing one's braille reading rate.

Years of education was positively correlated with pre-test formal comprehension and minutes practiced, but negatively correlated with percentage change in formal comprehension. As was concluded for the three groups, education has a positive effect on one's reading comprehension before rapid reading training, but fails to maintain that effect after the training. Education also appears to affect one's motivation to improve, in that practice time increased as years of education increased.

Predicted rate was positively correlated to both informal and formal pre-tests of rate and post-tests of rate as well as number of years of braille. Braille readers with the higher expectations of improving their rates were those with faster initial rates and those with faster rates after training. It is reasonable to understand that the longer one has read braille in terms of years, the higher would his rate expectations before rapid reading training.

Pre-test informal rate was positively correlated to informal and formal post-tests of rate and the number of years of braille. These positive correlations were also true for the pre-test variable of formal rate. Thus, the faster braille readers before training tended to be the faster readers after training. Improvements in rate, however, were not related to initial reading rate. The length of time one had read braille did have a positive effect on his rate before rapid reading training. Both informal and formal pre-tests of rate were negatively correlated with years of print. A negative relationship between formal rate increase and years of print existed ($-.33$), but missed the value required for significant at the .05 level ($-.38$). One might postulate that knowledge of the print symbol interferes with

the tactual perception involved in the braille reading process; a braille reader with knowledge of print must produce a single response from two very different stimuli.

Informal and formal post-tests of rate were both positively correlated to the number of years of braille, but they were negatively correlated to the number of years of print. Once again, experience with braille enhances reading rate of braille readers, while experience with print is a detriment to their rate. As one might expect, the number of fingers used during braille reading was positively correlated to post-test rate measured formally. A correlation coefficient of .38 was needed for significance at the .05 level, and the positive correlation between post-test informal rate and the number of fingers used just missed this value (.36).

Post-test formal comprehension was negatively correlated to percentage increases in both informal and formal rate. Braille readers who improved their rates to a greater degree were those with lower comprehension scores on the formal test.

Percentage increase in informal rate was negatively correlated to the number of years of braille. This negative relationship did not approach significance for the percentage increase in formal rate. The long-time braille readers were perhaps reluctant to "let go" and read in ways the training encouraged on the informal test.

Percentage increase in formal rate was positively correlated to the number of fingers used during braille reading. A positive relationship (.27) was found between percentage increase in informal rate and the number of fingers used, however, it did not reach significance at the .05 level. These findings would support those of Foulke and

Lappin (1973) who concluded that the best combination for reading was the two index fingers. They further concluded that one finger was equally as efficient as four fingers, thus, as the number of fingers used during braille reading goes beyond two, efficiency seems to be lost. It was beyond the scope of this study to test such an hypothesis.

Sex was not significantly correlated to pre- or post-test rates, pre- or post-test comprehension, or improvements in rate for the two braille groups. Therefore, female and male braille readers started the training with similar reading skills and received similar benefits from it. The studies by Niday (1939) and Umsted (1972), which both found females read faster and with better comprehension than males, has already been discussed.

Conclusions

Based on the results of this study, the following conclusions concerning the effects of McBride's techniques of rapid reading are summarized:

1. Reading rate can be significantly increased for braille and large print readers after sixteen hours of rapid reading training, without significant change in comprehension.
2. Reading rate on informal tests (no objective measure of comprehension) is significantly greater after rapid reading training than is rate on formal tests.
3. Rates predicted by braille and large print readers before rapid reading training do not significantly differ from rates achieved on informal tests after training.
4. Groups of large print and braille readers, while differing significantly in age, years of education, minutes of practice outside



of training, and initial motivation for taking rapid reading training, do not differ significantly in their rate increases or changes in comprehension level after rapid reading training.

5. Rate improvements made by braille and large print readers after rapid reading training are not significantly related to their reading rates before training.

6. Rate improvement after rapid reading training is negatively related to the age of braille and large print readers.

7. Reading rate before and after rapid reading training is negatively related to the number of years a braille reader has previously read print.

8. Rate improvement after rapid reading is positively related to the use of more than one finger in the braille reading process.

Recommendations

The findings of this study have produced nine recommendations. The first four are concerned with the teaching of reading to the visually handicapped, while the remaining five deal with suggestions for further research.

Teaching of Reading

1. The techniques of rapid reading described in this study should be incorporated into the regular reading instructional program of both braille and large print students.

2. Beginning braille instruction should place a greater emphasis on the use of more than one finger and independent movement of two hands to enhance reading rate.



3. Specific attention should be given to overcoming the possible interference of visual symbols for braille readers who formerly read print.

4. Educators ought to begin defining the process of "skimming" and teach it as a skill, along with the now-emphasized "careful" reading.

Further Research

1. Because practice time did not appear to affect rate improvements in this study, braille and large print readers should be tested for rate after intervals progressively shorter than sixteen hours. Furthermore, groups could be divided on the basis of amount of practice and monitored as to the kind of practice they were effecting.

2. The role motivation plays should be studied by comparing rate improvements made by readers receiving McBride's training to readers who simply are rewarded for "reading faster."

3. Braille and large print readers should be tested for retention of rate gains several months after rapid reading training.

4. A test with reading passages of suitable length and an objective measure of comprehension should be standardized for both braille and large print readers.

5. Groups of large print and braille readers, upon entering first grade, should be taught rapid eye or hand movements prior to learning the decoding of print or braille symbols. The rate and comprehension improvements over time ought then be compared with groups taught large print and braille reading in the traditional way of decoding first.



Implications

The final section of this paper will be devoted to some general implications, drawn by the researcher, relating to a personal evaluation of the rapid reading techniques used in this study. Having both taught and evaluated McBride's techniques with the visually handicapped, the researcher will attempt to enumerate some strengths and weaknesses of his approach as they presently appear.

As indicated previously, more research ought to be done on the efficacy of rapid reading training for beginning braille and large print readers. The informal testing, routinely used by McBride (1974), is impossible to reproduce in any exact fashion. The prose fiction read for training purposes, as well as for testing, differs a great deal in format, ease of reading and appeal to the individual reader. Furthermore, one reader's definition of "book report" comprehension may differ considerably from another's. Despite the difficulties inherent in using formal tests, they can still be employed for comparing the effectiveness of the training on various age levels of readers.

A number of workshop participants have expressed disappointment in the reading rates they personally achieved. Some placed the blame on their own personal failure to "catch on" to the techniques; others felt that the training simply did not do what McBride claims it does. Perhaps the claims for McBride's rapid reading training ought to emphasize the numerous factors contributing to an individual's success as heavily as they now emphasize what has been possible for some readers (i.e., 1600 WPM). Not only will one's sensory abilities and intellectual capacity have some effect on how rapidly he picks up reading speed, but one's



personality and general approach to "unconventional ways of doing things" will have a profound effect. One of the steps of the training involves reading for no comprehension; several of the older individuals found this extremely difficult to accomplish. It seemed like a waste of their time and they had always been very precise, careful readers. "Going through the motions" is far different than truly internalizing a new way of doing something.

Even though this study showed that slow and fast readers received equal benefit from the rapid reading training, the faster readers were more successful at implementing "unconventional" ways of encountering words. The method used by the two fastest readers in the braille groups actually involved reading backwards over half of a line with the left hand in order to pick up extra information, while waiting for the right hand to drop down and begin that new line. One might hypothesize that a minimum speed must be obtained before incoming information can be interpreted "out of sequence." Readers, who are still attempting to discern the geometry of the braille cell (or print readers the print symbol) are probably hampered in their application of rapid reading techniques. This is why we need to work on eye and hand movements before we teach children to decode symbols. Once we have accomplished efficient eye or hand movements, then the decoding process should probably be taught simultaneously with rapid reading techniques.

When observing a braille reader rapidly "return sweep," one cannot help but believe that it is exhausting to move the hands so rapidly. Some braille readers admitted that they could not continue the rapid movements for too long before tiring. Interestingly enough, however, a few braille readers found that the rapid movement actually helped



release tension and was therefore less fatiguing than slow hand movements. They believed that the method simply took a period of adjustment; how long this period actually is, must depend on the individual reader. One woman reported that rapid reading suppressed arthritic stiffness in her fingers. Perhaps we should research this rather unusual effect more carefully.

Although a two-week training period may be more than adequate to provide readers with ideas for enhancing reading rate, it is doubtful that this time period is sufficient to sensitize new fingers for reading braille. Several workshop participants reported feeling a few symbols with fingers they had not previously used for reading, however, few accomplished any real degree of efficiency with those new fingers.

It is the opinion of the researcher that anyone can learn to read more rapidly using techniques described by McBride. It should perhaps be recognized that not everyone will want to employ "rapid reading" in every situation. This might be especially true for readers who wish to savor an author's writing style; allowing for reflection of ideas might make subvocalization a desirable activity.

In summary, McBride's rapid reading techniques are not magical; they will not bring every reader equal success. In fact, some might say that the techniques are just rules of "common sense." While this may be true, most of us in education need someone to embody that common sense for us and make it a teaching approach. Although carefully controlled studies are still needed to evaluate the exact processes involved for reading braille or large print, it is important that we remain open-minded about rapid reading techniques. It is time for us all to stop accepting the fact that braille and large print reading are "inherently slow."



APPENDIX A

MCBRIDE'S DIRECTIONS FOR INCREASING ONE'S

READING RATE

(A Workshop Hand-out)



DIRECTIONS FOR INCREASING ONE'S READING RATE

1. Get a stop watch or some other accurate timing device.
2. Have on hand several easy (nothing above third or fourth grade level) story or reading books.
3. It is possible for some of you to see an entire page clearly, while some can see only parts of pages at a glance.
4. See the words in anyway you wish, across, down, down and up, diagonally, zig-zag, etc.
5. See as much of the page or as many parts of the page as you can at one glance.
6. Do not (repeat), do not try to understand any of the words. See them as fast as you can and as many as you can in five seconds.
7. This process should be followed for two or three days, practicing moving the eyes over the pages rapidly with no attempt to understand what the words say. Try to go faster each time, without saying the words in your mind.
8. Go over the same page(s) again and again. On about the third day of practice begin to try to understand some of the words. Try to answer a few questions, such as "Why", "Where", "What kind", "What color", etc. In doing this, do not slow down. Remember, you are to try to understand only a few of the words now. Remember, also you are to look at them any way you can see them best, i.e., from left to right, right to left, straight down, zig-zag, etc.
9. Begin each practice period with "warm-up" exercises, i.e., practicing for speed and breadth of vision only with no effort made to understand. After two or three 20 to 60 seconds "warm-ups" move into comprehension, attempting more and more understanding everyday.
10. As comprehension improves, you should begin to attempt to visualize, or picturize, some of what you are reading. Try to see "moving" pictures, in color whenever possible.
11. You may want to slow down in order to improve your comprehension. Do so if necessary, and/or change your eye-movement pattern and the position of your reading materials.
12. Begin to think in terms of Main Ideas, of Sequence of Ideas, or Main Characters. Was there one part of the story you liked more than another? Why? Did you like the descriptions? Were there any words you did not understand.

13. Pick a selection and try to read it in a given length of time. Adjust your speed to suit your particular needs. Now work for "book report" type comprehension. Why did the author write as he did? Did you feel a part of the story? Did you enjoy it? Why?



APPENDIX B

OUTLINE OF RAPID READING TRAINING

OUTLINE OF RAPID READING TRAINING

DAY 1

1. Introduction of instructor, students, and course
2. Relating the accomplishments of others after rapid reading training
3. Question and answer period regarding principle behind rapid reading
 - a. To read rapidly is to encounter every word
 - b. To read rapidly one must break old habits and learn new ways of "encountering" words on a page
4. Introduce the concept of "unreading" (encountering words so rapidly that no understanding is possible). The purpose of unreading is to break old habits of moving one's eyes or hands.
5. Choose a book to read
6. Instruction for approximating words on a page
 - a. Count every word in the first ten lines and divide the total by ten
 - b. Count the number of lines on a full page and multiply this number by the average number of words per line
7. Take informal rates to be recorded as the "pre-informal rate"
 - a. Use a stop watch, have individuals read for one minute
 - b. Count the approximate number of words read in that minute
 - c. Each person orally reports to the person sitting beside him everything he can remember of what he read in the minute
 - d. Repeat steps a-c three times; record the rate for each person which reflected "book report" understanding (80% or better)
8. Practice "unreading" and different ways of moving the eyes or hands
9. Each reader is asked to keep track of time spent in practice outside the training sessions.

DAY 2

(First day of actual training)

1. Time for sharing discoveries of practice time and asking questions
2. Discuss ways of increasing one's rate of reading
 - a. Faster return sweeps (eyes or hands)
 - b. More efficient ways of turning pages
 - c. Using more fingers (braille reader)
 - d. Taking in more words horizontally, vertically with one's eyes (print reader)
 - e. Using context clues
 - f. Becoming familiar with the shape of common words
 - g. Reduction of subvocalization
 - h. Using book props, new book positions, sitting positions
 - i. Using fingers or paper guides (print reader)
 - j. Chewing gum (effective for some)
3. Practice unreading on same material, attempting to go farther during each timing. (Four 15-second timings).
4. Practice going as far in 10 seconds on the same material as each person went in 15 seconds.



DAY 2 (continued)

5. Maintaining same speed of unreading, attempt to pick up an occasional letter or word. (Two 15-second timings).
6. Try various ways of encountering with eyes or hands. (Several 15-second timings).
7. Try picking up "bits and pieces" reading at unreading rates (couple words on a page). (Two 20-second timings).
8. Read for book report comprehension for 20 seconds; discuss feelings of frustration.
9. Read for bits and pieces during six 20-second timings; every other timing should be on new material.
10. Discuss Delacato's theory of brain development and how it relates to one's ability to read.
 - a. A child must pass through various stages (i.e. creeping, crawling) to fully develop parts of brain
 - b. For those who never passed through the creeping stage, practice creeping
11. Record practice time

DAY 3

1. Time for sharing discoveries of practice time and asking questions
2. Practice unreading during three 30-second timings, each time trying to go farther on the same material.
3. Practice reading for 2-3 words per page at unreading speed. (Two 30-second timings).
4. Review ways of increasing one's rate
5. Two 30-second timings of unreading for smoothness
6. Discuss the techniques each individual has been using for encountering words.
7. Practice bits and pieces of reading for one word per line; have individuals try to describe the thread of their stories from this reading. (Four 30 second-timings on new material, four on material covered once).
8. Have individuals set goals as to the number of lines they will read in 60 seconds, picking up one word (approximately) per line. (Two 60-second timings).
9. Take rate of reading during a 15-second timing; ask each reader to read his "old way".
10. Record practice time.

DAY 4

1. Time for sharing discoveries of practice time and asking questions
2. Practice unreading during three 30-second timings on the same material, each time trying a new way of encountering words.
3. Review ways of increasing one's rate
4. Practice reading for bits and pieces (several words per page); tell neighbor orally what the "thread" of the story is. (Two 30-second timings).

DAY 4 (continued)

5. Practice two 60-second timings on the same material, picking up twice as many bits and pieces without slowing slow; ask for volunteers to share what they understood with the entire group.
6. During a 60-second timing each individual goes over a single line; each time over the line, one is to pick up more information without slowing down from the "unreading" speed.
7. Two 60-second timings, each reader reading as fast as possible to understand about half of what he reads; report to neighbor what was understood.
8. Discussion of skimming and scanning vs. encountering
 - a. Skimming and scanning imply skipping over material to come in contact (eyes or hands) with certain key words, phrases or sentences
 - b. Encountering implies coming in contact with every symbol on a page, perhaps spending more time on some symbols than on others
9. Two 15-second timings on new material at unreading speeds, no understanding
10. Three 60-second timings, trying to understand approximately half, each time on new material.
11. Take a 60-second timing on new material for half understanding; each reader tells his neighbor what he read and the rate is computed.
12. Record practice time

DAY 5

1. Time for sharing discoveries of practice time and asking questions
2. Three 30-second timings: (All over the same material)
 - a. First time for no understanding
 - b. Second time for 4-6 words per page
 - c. Third time for 8-12 words per page
3. One 60-second timing for half understanding over same material as above, without decreasing speed
4. Two sequences of timing such as the following:
 - a. 60-second timing, understand half; tell neighbor what was read
 - b. 30-second timing, add details to what is already known without slowing down; tell neighbor what additional information was picked up
5. Discussion of individual progress, feelings about the training
6. Take rates on a 60-second timing, understanding half, and telling neighbors what was read; compare with rate taken on day 4
7. One 30-second timing reading for speed only, no understanding
8. One 30-second timing reading for book report understanding; discuss the progress made, if any
9. Discuss how each member of the group "visualizes" what they read (pictures, sounds, experiences, etc.)
10. Record practice time



DAY 6

1. Time for sharing discoveries of practice time and asking questions
2. Review ways of increasing one's rate
3. Two 30-second timings over same material, second time going farther than the first (speed only, no understanding)
4. Three timings on the same material:
 - a. 120 seconds for half understanding
 - b. 60 seconds for more details
 - c. 60 seconds for more details
5. Discussion of comprehension
 - a. The type when one reads for facts (for tests)
 - b. The type for enjoyment that evokes feelings
6. Four timings on the same material in the following sequence:
 - a. 30 seconds for speed only, no understanding
 - b. 60 seconds for bits and pieces, a few words per page
 - c. 60 seconds for more bits and pieces
 - d. 60 seconds for filling in gaps and achieving book report understanding
7. Discussion of memory; illustrate that attaching meaning to symbols aids memory (i.e. snb, ptq and oqs are harder sequences of letters to remember than pig, toy, and log).
8. Demonstrate the use of pneumatic devices for facilitating memory
 - a. Ask each person to name a noun object and give it a number between one and twenty; trainer makes a picture association between the number and the object
 - b. Trainer orally repeats the noun objects in the order asked for by the group
9. Discuss how one can make visual, auditory, tactual and kinesthetic associations as he reads to facilitate memory of what is read.
10. Record practice time

DAY 7

1. Time for sharing discoveries of practice time and asking questions
2. Reinforced the use of a memory system by trainer repeating the noun objects given by the group on day 6
3. Four timings on the same material in the following sequence:
 - a. 30-second timing, reading for speed only and no understanding
 - b. 30-second timing, reading for a few words per page
 - c. 30-second timing, reading for more words per page
 - d. 30-second timing, reading for half understanding (and going just as far as for speed only the first time)
4. One 60-second timing on new material; ask individuals to read "their old way"
5. Three sequences of timings as in the following:
 - a. 60 seconds, new material, understand about two-thirds; tell neighbor what was read
 - b. 60 seconds, same material pick up more details; tell neighbor what additional information was picked up
 - c. 60 seconds, same material, faster rate to go farther, pick up more; tell neighbor what else was understood

DAY 7 (continued)

6. Take rate on a 60-second timing for two-thirds understanding after orally reporting what was read.
7. Three 30-second timings:
 - a. First time for speed only
 - b. Second time for the thread of the story
8. One 60-second timing on the same material as above for two-thirds understanding, go just as far as on the 30-second timing for thread
9. One 60-second timing for two-thirds understanding on new material; report to neighbor on what was read
10. One 60-second timing for itsy-bitsy details on same material as above
11. One 60-second timing on new material for two-thirds understanding; set goal for next day.
12. Record practice time

DAY 8

1. Time for sharing discoveries of practice time and asking questions
2. Review ways of increasing one's rate
3. Four timings on the same material in the following sequence:
 - a. 30 seconds for speed only, no understanding
 - b. 30 seconds for a few words per page
 - c. 60 seconds for more words per page, go farther
 - d. 60 seconds for enjoyable understanding
4. Take rate on a 60-second timing, new material, two-thirds understanding; discuss whether or not individuals attained their goals
5. Two timings on the same material, trying a new way of encountering:
 - a. 60 seconds, two-thirds understanding; report to neighbor
 - b. 120 seconds, two-thirds understanding, go farther; report to neighbor
6. Discuss the theory on "lack of dominance" and its relation to reading
 - a. Have individuals describe which is their dominant hand, foot, eye, etc.
 - b. Relate research and case studies done on individuals who lack dominance
 - c. Encourage persons, who wish to try establishing a dominant side, to force use of a particular hand in eating, doing various routine tasks, and noting if reading ability improves
7. Two 30-second timings to do the following:
 - a. Choose a word on a page that has not been read; take the 30 seconds reading for speed and try to identify the word
 - b. Choose two words a distance apart and do the same as above
8. Two timings on the same material:
 - a. 60-second timing for three-fourths understanding; tell neighbor what was read
 - b. 120-second timing for three-fourths understanding, go farther; tell neighbor what was read
9. Record practice time

DAY 9

1. Time for sharing discoveries of practice time and asking questions
2. Review ways of increasing speed of reading
3. Four timings on the same material:
 - a. 30 seconds, unreading
 - b. 30 seconds, a few words per page
 - c. 60 seconds, go farther, get thread of the story; tell neighbor what the thread is
 - d. 60 seconds, book report understanding; tell neighbor additional information picked up
4. Two 60-second timings on the same material:
 - a. First time book report understanding
 - b. Second time, book report understanding, go farther
5. Three sequences as below:
 - a. 20 seconds of unreading
 - b. 60 seconds for book report understanding; report orally to neighbor
6. Establish informal post-test rate by giving three 60-second timings; record the rate during which each person understood the most or approximated "book report" understanding
7. Record practice time

Note:

1. Each reader was free to exchange the book he originally chose the first day for another; the only exception was during the last two days when individuals were asked to keep the same book. By doing this, reading rate would not drop appreciably because of new material.
2. A tenth training session took place for the Missouri braille group; only part of the group was able to attend due to plane departure times, however. Therefore, data was not gathered on this last day, and the North Dakota groups were only given the nine days of instruction. In this way, all three groups involved in the study were given eight actual training sessions between pre- and post-testing for rate and comprehension.



APPENDIX C

BRAILLE AND LARGE PRINT BOOKS USED FOR TRAINING AND TESTING
IN THE MISSOURI AND NORTH DAKOTA RAPID READING WORKSHOPS

BRAILLE BOOKS USED FOR TRAINING AND TESTING IN THE
MISSOURI RAPID READING WORKSHOP

- Conrad, J. Lord Jim. Garden City, New York: Doubleday, 1920.
- Defoe, D. Robinson Crusoe. New York: Franklin Watts, Inc., 1946.
- Greene, C. A girl called Al. New York: Viking Press, 1969.
- Heuman, W. Fast break rebel. New York: Dodd, 1971.
- Holt, V. King of the castle. Garden City, New York: Doubleday, 1967.
- Footlick, ed. Career choices for the 70's. Princeton, New Jersey:
Dow Jones, 1969.
- Klein, D. Super shopper. New York: Praeger, 1971.
- McNeer, M. Stranger in the pines. Boston: Houghton-Mifflin, 1971.
- Neufeld, J. Lisa bright and dark. New York: S. G. Phillips, 1969.
- Peyton, K. M. The Beethoven medal. Crowell, 1972.
- Shaw, R. Running. New York: Putnam, 1973.
- Splaver, S. Your personality and you. Messner, 1965.

Note: All of the above books are reprinted in braille by the American
Printing House for the Blind, Louisville, Kentucky.

BRAILLE BOOKS USED FOR TRAINING AND TESTING IN THE
NORTH DAKOTA RAPID READING WORKSHOP

- Alcott, L. Jo's boys. Louisville, Kentucky: American Printing House for the Blind, 1970.
- Alcott, L. Little women. Louisville, Kentucky: American Printing House for the Blind, 1965.
- Alcott, L. Rose in bloom. Louisville, Kentucky: American Printing House for the Blind, 1965.
- Bell, M. Love is forever. Louisville, Kentucky: American Printing House for the Blind, 1955.
- Brink, C. Caddie Woodlawn. Louisville, Kentucky: American Printing House for the Blind, 1953.
- Chaucer, G. Chanticleer and the fox. Louisville, Kentucky: American Printing House for the Blind, 1959.
- Dickens, C. Great expectations. Louisville, Kentucky: American Printing House for the Blind, 1948.
- Dodge, M. Hans Brinker. Louisville, Kentucky: American Printing House for the Blind, 1915.
- Gallico, P. The snow goose. Louisville, Kentucky: American Printing House for the Blind, 1962.
- Gardner, E. You can die laughing. Louisville, Kentucky: American Printing House for the Blind, 1957.
- Gray, E. Adam of the road. Louisville, Kentucky: American Printing House for the Blind, 1959.
- Rambeau, J. Mystery of Morgan's castle. San Francisco: National Aid to the Visually Handicapped, 1962.
- Sheldon, W. Sheldon basic reading series (grades 2-6). Louisville, Kentucky: American Printing House for the Blind, 1968.
- Twain, M. Huckleberry Finn. Louisville, Kentucky: American Printing House for the Blind, 1968.
- Twain, M. The prince and the pauper. Louisville, Kentucky: American Printing House for the Blind, 1962.
- Williams, M. The velveteen rabbit. Louisville, Kentucky: American Printing House for the Blind, 1955.

LARGE PRINT BOOKS USED FOR TRAINING AND TESTING IN THE
NORTH DAKOTA RAPID READING WORKSHOP

- Alcott, L. Little women. San Francisco: National Aid to the Visually Handicapped, 1965.
- Barrie, S. Carpet of dreams. London: Mills and Boon LTD, 1973.
- Defoe, D. Robinson Crusoe. New York: Franklin Watts, 1946.
- Dickens, C. Great expectations. New York: Franklin Watts, 1948.
- Gardner, E. Case of the stepdaughter's secret. New York: William Morrow, 1966.
- Jackson, J. Call me Charley. New York: Harper and Row, 1945.
- Justus, M. Holidays in no-end hollow. Champaign, Illinois: Garrard Publishing Company, 1970.
- Lattimore, E. The bus trip. New York: William Morrow, 1965.
- L'Honniedieu, D. Scampy - the little black cocker. Philadelphia: J. B. Lippincott, 1939.
- Moore, M. Second love. London: Mills and Boon LTD, 1970.
- Sewell, A. Black Beauty. New York: Franklin Watts, Inc., 1959.
- Sheldon, W. Sheldon basic reading series (grades 2-6). Rockleigh, New Jersey: Allyn and Bacon, 1968.
- Spyri, J. Heidi. Louisville, Kentucky: American Printing House for the Blind, 1965.
- Stevenson, R. Treasure island. New York: Franklin Watts, 1954.
- White, E. Charlotte's webb. New York: Harper and Row, 1952.

APPENDIX D
RANGES OF PERFORMANCE FOUND DURING
RAPID READING STUDY

RANGES OF PERFORMANCE FOUND DURING RAPID READING STUDY

	Missouri Braille	N. Dak. Braille	N. Dak. Large Print
Highest informal pre-test rate	250 WPM	164 WPM	279 WPM
Lowest informal pre-test rate	20 WPM	24 WPM	40 WPM
Highest informal post-test rate	855 WPM	477 WPM	788 WPM
Lowest informal	100 WPM	30 WPM	90 WPM
Highest percentage increase informal rate	750%	443%	600%
Lowest percentage increase informal rate	54%	20%	52%
Highest formal pre-test rate	259 WPM	157 WPM	160 WPM
Lowest formal pre-test rate	30 WPM	24 WPM	43 WPM
Highest formal post-test rate	338 WPM	228 WPM	318 WPM
Lowest formal post-test rate	30 WPM	21 WPM	43 WPM
Highest percentage increase formal rate	64%	93%	143%
Lowest percentage increase	4%	-8%	-3%
Highest pre-test comprehension	100%	100%	94%
Lowest pre-test comprehension	67%	35%	44%
Highest post-test comprehension	96%	100%	100%
Lowest post-test comprehension	65%	53%	58%

RANGES OF PERFORMANCE (continued)

	Missouri Braille	N. Dak. Braille	N. Dak. Large Print
Greatest increase in comprehension	19%	50%	78%
Greatest decrease in comprehension	-33%	-15%	-36%

Note: All numbers have been rounded off to the nearest whole number.

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